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APPENDIX A

Procedures for manually operating compressors are given to operators. An example of these procedures, used at a specific South African mine, is summarised in Table A-1.

Table A-1: Example of procedures to manually start-and-stop a compressor

Start a compressor	
1	Remove emergency stop on compressor touch panel
	Start cooling tower no 1
	Start cooling tower no 2
	Start cooling fan no 1
2	Start cooling fan no 2
	Start cooling fan no 3
	Start cooling fan no 4
	Start water-circulating pump no 1
3	If compressor panel shows “not ready”, check for sufficient oil temperature (40 °C to 45 °C)
4	If compressor panel shows “ready”, start compressor
5	If compressor is running, open RED and GREEN valves on oil cooler
6	Let compressor run for approximately three minutes, then put compressor on load with blue button
Stop a compressor	
1	Unload compressor
2	Let compressor run for approximately three minutes
3	Stop compressor
4	Wait until compressor is fully stopped (main shaft is standing still)
5	Close RED and GREEN valves at oil cooler
	Stop cooling tower no 1
	Stop cooling tower no 2
	Stop cooling fan no 1
6	Stop cooling fan no 2
	Stop cooling fan no 3
	Stop cooling fan no 4
	Stop water-circulating pump no 1
7	Push emergency stop in on compressor touch panel

APPENDIX B

The model on which the EMS development was based, is shown in the UML diagram in Figure B-1. This diagram represents the main software classes and the interaction of these classes with one another.

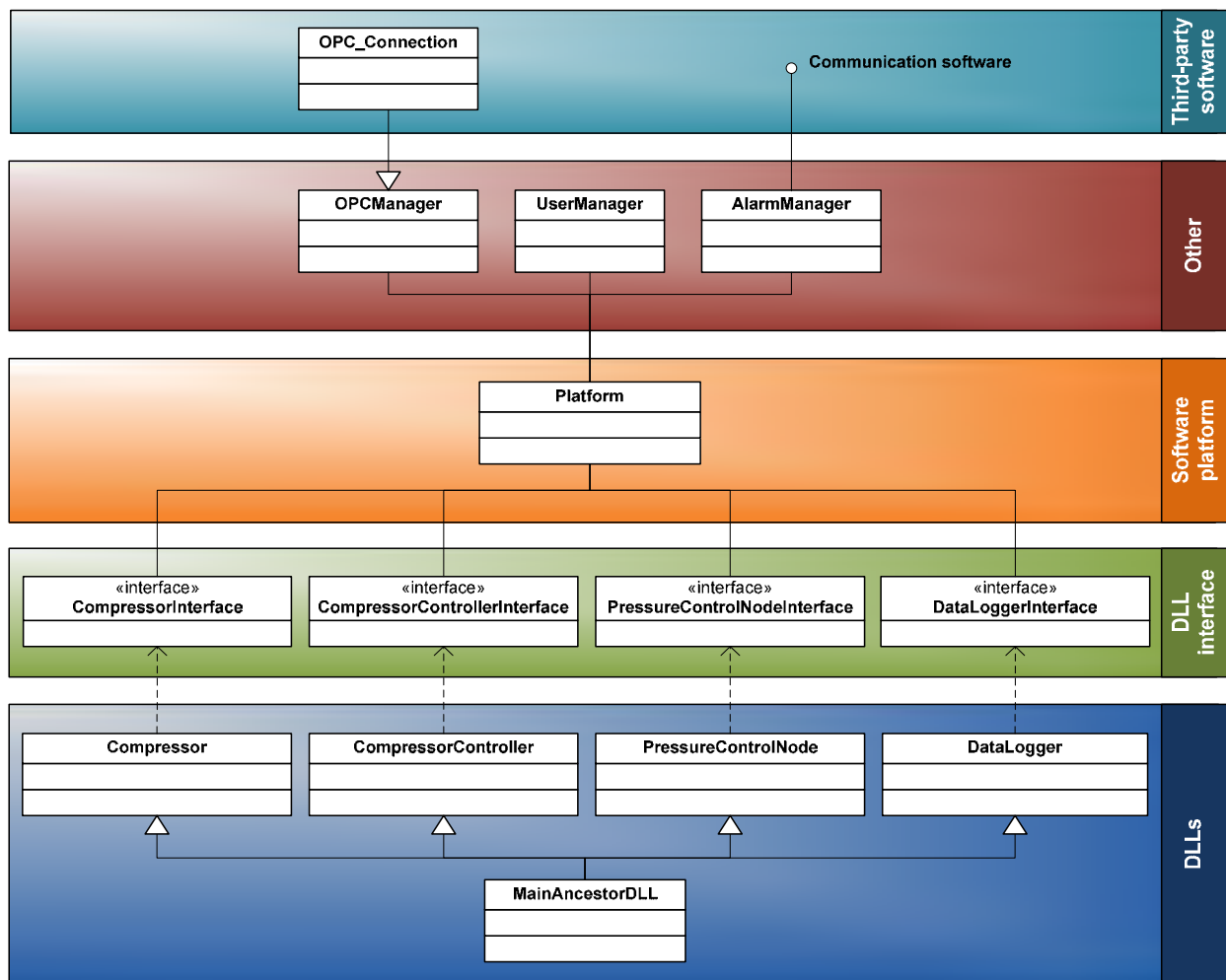


Figure B-1: UML diagram of EMS

MainAncestorDLL is a base class. The *Compressor*, *CompressorController*, *PressureControlNode* and *DataLogger* classes are derived from the *MainAncestorDLL* class, inheriting all the properties and functions of this class. The respective DLL interfaces are used by the *Platform* class to access each of these derived classes.

The *OPCManager* class is derived from a third-party OPC class: *OPC_Connection*, which gives the *Platform* class the functionality of an OPC client. EMS interfaces with third-party communication software in order to transmit e-mail and SMS alarms and notifications.

APPENDIX C

The results obtained from implementation of EMS on ten compressor systems are presented in this appendix. The impact on these compressor systems are quantified by the achieved reductions in electricity consumption and cost. These reductions are calculated for the average weekday, Saturday and Sunday and are interpolated to average monthly values.

Mine A

Table C-1: Average weekday, Saturday and Sunday impact profiles for Mine A

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	7,049	4,439	2,610	410	476	6,805	4,247	2,558	402	467	6,147	3,845	2,302	362	420
1	7,061	4,531	2,530	398	462	6,901	4,291	2,610	410	476	6,150	4,023	2,127	334	388
2	7,089	4,447	2,641	415	482	6,896	4,273	2,623	412	479	6,340	4,011	2,329	366	425
3	7,077	4,311	2,765	435	505	6,858	4,213	2,645	416	483	6,337	4,010	2,327	366	425
4	7,055	4,185	2,869	451	524	6,765	4,165	2,600	409	474	6,017	3,997	2,020	318	369
5	7,058	4,103	2,955	465	539	6,834	4,137	2,697	424	492	5,992	3,996	1,996	314	364
6	7,071	4,560	2,510	564	858	6,763	4,737	2,026	319	370	5,889	3,920	1,969	309	359
7	7,597	5,279	2,318	851	3,047	7,437	5,374	2,063	464	705	6,097	3,841	2,255	355	412
8	9,534	6,674	2,859	1,049	3,758	8,859	6,942	1,917	431	655	5,900	3,981	1,919	302	350
9	11,406	9,789	1,616	593	2,125	9,837	8,970	867	195	296	5,750	4,035	1,715	270	313
10	12,101	11,378	723	163	247	10,260	9,678	582	131	199	5,358	4,250	1,108	174	202
11	11,760	11,748	12	3	4	10,300	9,103	1,197	269	409	5,327	4,434	892	140	163
12	11,586	10,311	1,275	287	436	10,048	7,112	2,936	462	536	4,854	4,345	509	80	93
13	11,179	8,315	2,864	644	979	8,819	5,845	2,975	468	543	4,923	4,097	826	130	151
14	10,196	6,133	4,062	913	1,388	7,549	4,411	3,138	493	573	4,932	3,850	1,081	170	197
15	8,544	4,845	3,698	831	1,264	6,539	4,125	2,414	379	441	5,206	3,864	1,342	211	245
16	7,222	4,337	2,884	649	986	6,372	4,100	2,272	357	415	5,255	3,854	1,400	220	256
17	6,756	4,337	2,419	544	827	6,081	3,964	2,116	333	386	5,285	3,926	1,359	214	248
18	6,642	4,350	2,292	841	3,013	5,878	4,073	1,805	406	617	5,394	3,817	1,577	248	288
19	6,467	4,259	2,208	811	2,903	6,158	3,960	2,198	494	751	5,325	3,874	1,451	228	265
20	6,615	4,272	2,343	527	801	6,182	3,963	2,219	349	405	5,455	3,904	1,551	244	283
21	6,714	4,251	2,463	554	842	6,171	3,988	2,183	343	398	5,684	3,985	1,699	267	310
22	6,762	4,291	2,471	388	451	6,179	4,001	2,178	342	398	5,767	4,064	1,704	268	311
23	6,911	4,400	2,511	395	458	6,221	4,015	2,206	347	403	6,347	4,140	2,207	347	403

Table C-2: Summary of results for Mine A

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	197	58	13,181	27,374
Saturday	177	53	9,054	11,369
Sunday	136	40	6,235	7,239
Monthly	5,594	1,645	351,131	676,651

Mine B

Table C-3: Average weekday, Saturday and Sunday impact profiles for Mine B

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	39,711	21,505	18,206	2,862	3,323	25,568	18,728	6,840	1,075	1,248	20,332	15,249	5,082	799	928
1	40,918	21,572	19,346	3,041	3,531	26,138	18,789	7,349	1,155	1,341	20,536	15,396	5,140	808	938
2	41,343	21,549	19,794	3,112	3,612	26,009	18,746	7,263	1,142	1,326	20,533	15,266	5,267	828	961
3	41,212	21,427	19,785	3,110	3,611	25,865	18,531	7,334	1,153	1,338	20,484	15,404	5,080	799	927
4	40,807	21,147	19,661	3,091	3,588	25,578	18,336	7,242	1,138	1,322	20,287	15,724	4,563	717	833
5	40,019	20,771	19,247	3,026	3,513	25,439	18,314	7,125	1,120	1,300	20,389	15,902	4,487	705	819
6	39,566	20,938	18,628	4,188	6,365	25,373	18,088	7,284	1,145	1,329	20,239	16,202	4,037	635	737
7	40,164	21,161	19,003	6,974	24,976	25,575	18,307	7,268	1,634	2,483	19,462	16,456	3,006	472	549
8	41,670	21,742	19,928	7,314	26,191	25,613	18,413	7,200	1,619	2,460	19,225	16,495	2,730	429	498
9	41,954	22,317	19,637	7,207	25,808	25,712	18,877	6,836	1,537	2,336	19,231	16,509	2,723	428	497
10	42,191	22,427	19,764	4,443	6,753	26,012	18,924	7,087	1,593	2,422	19,570	17,283	2,287	360	417
11	42,324	22,109	20,215	4,544	6,907	25,772	18,402	7,370	1,657	2,518	19,603	16,800	2,802	441	511
12	40,935	20,964	19,971	4,490	6,824	25,259	17,810	7,449	1,171	1,359	19,851	17,119	2,731	429	498
13	39,214	20,552	18,662	4,195	6,377	24,825	17,463	7,362	1,157	1,344	20,277	17,318	2,959	465	540
14	37,946	20,537	17,409	3,914	5,949	24,432	17,633	6,799	1,069	1,241	20,040	17,320	2,720	428	496
15	37,398	20,427	16,971	3,815	5,799	24,409	17,623	6,786	1,067	1,238	19,852	17,415	2,437	383	445
16	37,371	20,012	17,359	3,902	5,931	24,508	17,338	7,171	1,127	1,309	20,500	17,601	2,899	456	529
17	37,021	18,735	18,287	4,111	6,249	24,101	16,237	7,865	1,236	1,435	20,964	17,672	3,292	517	601
18	36,465	18,052	18,413	6,758	24,200	23,213	15,150	8,063	1,813	2,755	22,157	18,390	3,767	592	687
19	36,192	17,909	18,283	6,710	24,029	22,989	14,596	8,394	1,887	2,868	23,934	18,384	5,551	873	1,013
20	35,833	18,516	17,316	3,893	5,917	22,908	13,793	9,115	1,433	1,663	24,066	19,162	4,904	771	895
21	36,065	20,012	16,053	3,609	5,485	22,721	13,757	8,965	1,409	1,636	24,085	20,272	3,813	599	696
22	36,997	20,420	16,577	2,606	3,025	21,214	13,955	7,259	1,141	1,325	24,322	20,733	3,589	564	655
23	38,221	20,907	17,313	2,722	3,160	20,470	14,252	6,219	978	1,135	25,075	21,207	3,868	608	706

Table C-4: Summary of results for Mine B

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	942	446	103,634	221,124
Saturday	590	178	31,455	40,733
Sunday	505	90	14,107	16,377
Monthly	25,093	10,878	2,462,188	5,093,168

Mine C

Table C-5: Average weekday, Saturday and Sunday impact profiles for Mine C

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	16,924	11,155	5,768	907	1,053	18,290	11,218	7,072	1,112	1,291	17,000	10,390	6,610	1,039	1,206
1	17,037	11,275	5,762	906	1,052	18,290	11,218	7,072	1,112	1,291	17,000	10,195	6,805	1,070	1,242
2	17,037	11,230	5,807	913	1,060	18,290	11,125	7,165	1,126	1,308	17,000	10,622	6,378	1,003	1,164
3	16,990	10,807	6,182	972	1,128	18,290	10,767	7,523	1,183	1,373	17,000	9,992	7,008	1,102	1,279
4	16,894	9,666	7,227	1,136	1,319	18,185	9,390	8,795	1,383	1,605	17,000	9,411	7,589	1,193	1,385
5	16,846	9,847	6,999	1,100	1,277	17,870	9,168	8,702	1,368	1,588	17,000	9,320	7,680	1,207	1,402
6	17,817	11,346	6,470	1,455	2,211	17,870	10,967	6,903	1,085	1,260	17,000	10,568	6,432	1,011	1,174
7	17,288	11,403	5,885	2,160	7,735	13,970	10,995	2,975	669	1,017	17,725	9,812	7,913	1,244	1,444
8	17,802	11,515	6,287	2,308	8,264	14,390	11,310	3,080	692	1,053	17,000	10,121	6,879	1,081	1,255
9	18,450	11,586	6,864	2,519	9,021	15,020	11,483	3,537	795	1,209	16,275	10,223	6,052	951	1,105
10	18,768	11,595	7,172	1,612	2,451	15,020	11,207	3,813	857	1,303	17,000	10,203	6,797	1,069	1,241
11	18,718	11,341	7,377	1,658	2,521	15,020	11,264	3,756	844	1,283	16,013	10,441	5,572	876	1,017
12	18,452	11,202	7,249	1,630	2,477	14,810	11,146	3,664	576	669	16,275	10,693	5,582	877	1,019
13	18,257	11,100	7,156	1,609	2,446	14,810	10,839	3,971	624	725	16,275	10,661	5,614	882	1,024
14	18,184	10,946	7,237	1,627	2,473	14,810	11,102	3,708	583	677	16,275	10,739	5,536	870	1,010
15	17,429	10,967	6,461	1,453	2,208	14,020	11,127	2,893	455	528	16,275	10,371	5,904	928	1,077
16	17,322	9,540	7,781	1,749	2,659	13,810	9,560	4,250	668	776	16,275	9,524	6,751	1,061	1,232
17	17,227	9,021	8,205	1,845	2,804	13,810	9,062	4,748	746	866	16,275	9,018	7,257	1,141	1,324
18	17,227	8,741	8,486	3,114	11,153	13,810	8,673	5,137	1,155	1,755	16,275	8,969	7,306	1,148	1,333
19	17,311	8,828	8,482	3,113	11,148	13,810	8,788	5,022	1,129	1,716	16,275	9,097	7,178	1,128	1,310
20	17,311	10,670	6,640	1,493	2,269	13,600	10,435	3,165	497	578	16,275	10,698	5,577	877	1,018
21	17,311	11,150	6,161	1,385	2,105	13,600	10,737	2,863	450	523	16,538	11,189	5,348	841	976
22	17,730	11,051	6,679	1,050	1,219	13,600	10,830	2,770	435	506	16,538	11,146	5,391	847	984
23	17,503	11,072	6,431	1,011	1,174	13,600	10,501	3,099	487	566	17,988	10,961	7,026	1,105	1,282

Table C-6: Summary of results for Mine C

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	422	165	38,725	83,228
Saturday	369	116	20,032	25,462
Sunday	401	156	24,552	28,504
Monthly	12,357	4,713	1,030,278	2,046,879

Mine D

Table C-7: Average weekday, Saturday and Sunday impact profiles for Mine D

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	4,103	3,328	775	122	141	4,091	3,524	567	89	103	3,937	3,529	408	64	74
1	4,120	3,402	718	113	131	4,071	3,630	441	69	80	3,941	3,526	415	65	76
2	4,139	3,403	735	116	134	4,045	3,587	457	72	83	3,932	3,526	406	64	74
3	4,119	3,345	773	122	141	4,037	3,508	530	83	97	3,891	3,405	486	76	89
4	4,092	3,305	787	124	144	4,043	3,470	573	90	105	3,883	3,381	502	79	92
5	4,032	3,313	719	113	131	4,044	3,496	548	86	100	3,882	3,408	474	74	86
6	4,003	3,347	656	147	224	4,053	3,509	544	86	99	3,883	3,394	489	77	89
7	4,027	3,402	624	229	820	4,012	3,574	438	98	150	3,859	3,376	484	76	88
8	4,083	3,513	569	209	749	4,098	3,551	547	123	187	3,895	3,283	612	96	112
9	4,097	3,505	592	217	778	4,157	3,507	650	146	222	3,889	3,290	599	94	109
10	4,077	3,478	598	135	205	4,147	3,455	693	156	237	3,907	3,388	520	82	95
11	4,004	3,413	590	133	202	4,052	3,376	676	152	231	3,854	3,223	631	99	115
12	3,935	3,353	582	131	199	3,877	3,472	405	64	74	3,832	3,329	502	79	92
13	3,893	3,292	601	135	205	3,840	3,491	349	55	64	3,897	3,415	483	76	88
14	3,854	3,268	585	132	200	3,925	3,474	452	71	82	3,920	3,351	569	89	104
15	3,819	3,261	558	125	191	3,872	3,490	382	60	70	3,935	3,320	616	97	112
16	3,856	3,252	604	136	207	3,891	3,513	378	59	69	3,958	3,327	631	99	115
17	3,874	2,953	921	207	315	3,914	3,389	525	82	96	3,968	3,052	917	144	167
18	3,905	2,111	1,793	658	2,357	3,931	3,099	832	187	284	4,011	2,855	1,156	182	211
19	3,897	2,246	1,650	606	2,169	3,929	3,193	736	166	252	4,014	2,996	1,018	160	186
20	3,904	2,578	1,325	298	453	3,905	3,217	688	108	126	3,991	3,039	953	150	174
21	3,919	2,722	1,197	269	409	3,903	3,296	607	95	111	4,005	3,131	875	138	160
22	3,930	2,910	1,020	160	186	3,878	3,401	476	75	87	4,022	3,042	980	154	179
23	3,973	3,190	783	123	143	3,888	3,538	350	55	64	4,057	3,160	897	141	164

Table C-8: Summary of results for Mine D

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	96	20	4,760	10,834
Saturday	96	13	2,328	3,072
Sunday	94	16	2,456	2,851
Monthly	2,865	549	123,844	262,040

Mine E

Table C-9: Average weekday, Saturday and Sunday impact profiles for Mine E

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	30,445	26,072	4,372	687	798	30,512	24,762	5,750	904	1,049	28,209	18,361	9,847	1,548	1,797
1	31,167	26,311	4,856	763	886	31,295	24,838	6,457	1,015	1,178	28,705	18,357	10,348	1,627	1,888
2	31,371	26,533	4,837	760	883	31,305	24,907	6,399	1,006	1,168	28,713	18,483	10,231	1,608	1,867
3	31,519	26,778	4,741	745	865	31,277	24,952	6,326	994	1,154	28,670	19,014	9,656	1,518	1,762
4	31,584	27,118	4,465	702	815	31,278	25,152	6,127	963	1,118	28,637	18,967	9,670	1,520	1,765
5	31,608	27,224	4,384	689	800	30,830	25,394	5,436	854	992	28,685	19,200	9,485	1,491	1,731
6	31,685	27,417	4,267	959	1,458	31,178	25,487	5,691	895	1,039	37,852	19,108	18,744	2,946	3,421
7	31,567	27,601	3,966	1,456	5,213	31,134	25,619	5,515	1,240	1,885	25,058	16,683	8,375	1,317	1,528
8	31,636	27,624	4,012	1,473	5,273	31,330	25,705	5,625	1,265	1,922	19,507	15,384	4,123	648	752
9	31,414	27,727	3,686	1,353	4,846	31,305	25,900	5,406	1,215	1,847	15,696	15,493	202	32	37
10	31,406	27,665	3,740	841	1,278	31,362	25,744	5,618	1,263	1,920	16,069	16,422	-353	-55	-64
11	31,239	27,470	3,768	847	1,288	31,038	25,323	5,715	1,285	1,953	27,205	17,441	9,765	1,535	1,782
12	33,153	26,855	6,297	1,416	2,152	31,369	24,982	6,387	1,004	1,166	28,568	19,360	9,208	1,447	1,680
13	31,256	26,098	5,158	1,160	1,763	31,324	24,400	6,924	1,088	1,264	19,884	19,446	438	69	80
14	31,190	25,563	5,626	1,265	1,923	31,073	24,072	7,001	1,101	1,278	21,923	19,746	2,177	342	397
15	31,035	25,078	5,956	1,339	2,035	29,604	23,920	5,684	894	1,037	31,529	19,626	11,903	1,871	2,172
16	32,071	24,882	7,189	1,616	2,457	30,278	23,197	7,080	1,113	1,292	31,469	19,670	11,799	1,855	2,153
17	30,223	24,163	6,060	1,362	2,071	29,651	23,168	6,483	1,019	1,183	31,580	20,641	10,939	1,720	1,996
18	30,090	23,138	6,951	2,551	9,137	29,749	22,116	7,633	1,716	2,608	20,921	21,560	-639	-100	-117
19	29,792	23,214	6,578	2,414	8,645	29,144	21,598	7,545	1,696	2,578	21,471	22,285	-814	-128	-149
20	29,838	24,108	5,730	1,288	1,958	29,102	21,950	7,152	1,124	1,305	23,592	22,818	774	122	141
21	30,121	25,058	5,063	1,138	1,730	29,333	20,510	8,823	1,387	1,610	25,362	23,607	1,756	276	320
22	30,639	25,492	5,146	809	939	29,399	18,760	10,638	1,672	1,942	27,309	24,486	2,823	444	515
23	30,723	25,754	4,969	781	907	29,097	18,325	10,772	1,693	1,966	28,665	25,473	3,192	502	582

Table C-10: Summary of results for Mine E

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	747	122	28,417	60,121
Saturday	733	162	28,406	36,454
Sunday	625	154	24,153	28,041
Monthly	21,862	3,944	835,407	1,580,645

Mine F

Table C-11: Average weekday, Saturday and Sunday impact profiles for Mine F

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	7,360	4,349	3,010	473	549	7,415	3,269	4,146	652	757	6,873	3,288	3,585	564	654
1	7,308	4,318	2,990	470	546	7,399	3,269	4,130	649	754	6,874	3,288	3,585	564	654
2	7,301	4,349	2,952	464	539	7,195	3,269	3,926	617	716	6,849	3,288	3,561	560	650
3	7,263	4,349	2,914	458	532	7,227	3,269	3,957	622	722	6,836	3,289	3,548	558	647
4	7,163	4,235	2,927	460	534	7,121	3,269	3,852	606	703	6,837	3,289	3,548	558	648
5	7,128	4,148	2,97	468	544	7,094	3,269	3,825	601	698	6,853	3,289	3,564	560	650
6	7,053	4,204	2,849	641	974	7,095	3,269	3,826	601	698	6,729	3,289	3,440	541	628
7	7,116	4,433	2,683	985	3,526	7,132	3,821	3,311	744	1,131	6,371	3,289	3,082	485	563
8	7,853	5,376	2,476	909	3,255	8,101	4,193	3,907	878	1,335	5,903	3,288	2,615	411	477
9	9,503	6,060	3,442	1,263	4,524	9,015	4,299	4,716	1,060	1,611	5,807	3,288	2,519	396	460
10	10,364	6,325	4,038	908	1,380	9,219	4,299	4,920	1,106	1,681	5,760	3,288	2,472	389	451
11	10,549	6,260	428	964	1,465	9,033	4,059	4,975	1,118	1,700	5,988	3,288	2,700	424	493
12	10,294	5,947	434	977	1,486	8,648	3,998	4,650	731	849	6,201	3,287	2,914	458	532
13	9,459	5,063	4,395	988	1,502	7,822	3,269	4,553	716	831	6,447	3,287	3,160	497	577
14	8,204	4,299	3,905	878	1,335	7,231	3,119	4,112	646	750	6,433	3,288	3,145	494	574
15	7,598	3,966	3,631	816	1,241	6,993	2,980	4,013	631	732	6,486	3,287	3,199	503	584
16	6,880	3,678	3,202	720	1,094	6,882	2,980	3,902	613	712	6,690	3,313	3,376	531	616
17	6,822	3,865	2,957	665	1,011	6,871	2,980	3,890	612	710	6,692	3,455	3,237	509	591
18	6,865	3,874	2,990	1,098	3,931	6,840	2,981	3,859	868	1,319	6,705	3,480	3,225	507	589
19	6,977	3,609	3,368	1,236	4,427	6,788	2,981	3,807	856	1,301	6,713	3,668	3,045	479	556
20	6,949	3,739	3,209	722	1,097	6,872	2,981	3,891	612	710	6,718	3,722	2,997	471	547
21	6,905	4,042	2,862	644	978	6,879	2,981	3,898	613	711	6,719	3,480	3,239	509	591
22	6,853	4,157	2,696	424	492	6,918	2,981	3,937	619	719	6,711	4,202	2,509	394	458
23	7,101	4,171	2,929	461	535	6,865	2,981	3,884	611	709	6,698	4,168	2,530	398	462

Table C-12: Summary of results for Mine F

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	187	78	18,091	37,496
Saturday	179	98	17,382	22,560
Sunday	157	75	11,758	13,650
Monthly	5,454	2,408	514,567	969,744

Mine G

Table C-13: Average weekday, Saturday and Sunday impact profiles for Mine G

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	7,695	4,201	3,493	549	638	7,956	3,961	3,996	628	729	7,629	3,933	3,696	581	675
1	7,729	4,251	3,478	547	635	7,964	3,978	3,986	627	728	7,663	3,948	3,716	584	678
2	7,668	4,253	3,414	537	623	7,971	3,969	4,002	629	730	7,683	3,941	3,742	588	683
3	7,675	4,246	3,428	539	626	7,978	3,957	4,020	632	734	7,659	3,959	3,700	582	675
4	7,669	4,219	3,449	542	630	7,977	3,941	4,036	634	737	7,651	3,945	3,706	583	676
5	7,639	4,093	3,545	557	647	7,935	3,854	4,082	642	745	7,660	3,946	3,715	584	678
6	7,497	3,966	3,530	794	1,207	7,829	3,858	3,970	624	725	7,628	3,952	3,676	578	671
7	7,572	3,900	3,672	1,348	4,826	7,538	3,917	3,621	814	1,237	7,615	3,938	3,676	578	671
8	7,708	4,135	3,572	1,311	4,696	7,544	4,159	3,384	761	1,156	7,594	3,905	3,689	580	673
9	8,837	5,490	3,346	1,228	4,399	8,695	5,296	3,399	764	1,161	7,722	3,915	3,807	598	695
10	11,601	7,719	3,882	873	1,327	11,157	6,679	4,477	1,006	1,530	8,227	3,940	4,287	674	782
11	12,701	9,109	3,591	807	1,227	11,955	7,234	4,721	1,061	1,613	8,384	4,043	4,341	682	792
12	12,579	9,093	3,486	784	1,191	11,735	6,909	4,826	759	881	8,078	4,019	4,059	638	741
13	12,296	8,333	3,963	891	1,354	11,199	6,304	4,895	769	893	7,818	4,017	3,801	597	694
14	11,469	6,994	4,475	1,006	1,529	10,473	5,543	4,930	775	900	7,540	3,997	3,543	557	647
15	8,308	5,547	2,760	621	943	9,621	5,116	4,505	708	822	7,336	4,000	3,336	524	609
16	7,547	5,182	2,364	532	808	8,161	4,626	3,535	556	645	7,240	4,000	3,239	509	591
17	7,556	4,624	2,932	659	1,002	7,912	4,245	3,667	576	669	7,236	4,024	3,213	505	586
18	7,577	4,120	3,457	1,269	4,544	7,509	3,823	3,685	828	1,259	7,367	4,035	3,332	524	608
19	7,642	4,062	3,579	1,314	4,704	7,578	3,835	3,743	841	1,279	7,441	4,042	3,399	534	620
20	7,698	4,163	3,535	795	1,208	7,596	3,855	3,740	588	683	7,477	3,926	3,551	558	648
21	7,678	4,189	3,489	784	1,192	7,576	3,831	3,745	589	683	7,440	3,907	3,533	555	645
22	7,650	4,214	3,435	540	627	7,536	3,834	3,702	582	676	7,425	4,170	3,255	512	594
23	7,760	4,196	3,564	560	651	7,570	3,822	3,748	589	684	7,507	4,283	3,224	507	588

Table C-14: Summary of results for Mine G

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	208	83	19,386	41,233
Saturday	207	96	16,984	21,899
Sunday	183	87	13,714	15,921
Monthly	6,131	2,571	549,289	1,058,396

Mine H

Table C-15: Average weekday, Saturday and Sunday impact profiles for Mine H

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	40,222	22,024	18,199	2,861	3,321	41,715	18,551	23,164	3,641	4,227	30,850	13,966	16,885	2,654	3,081
1	40,475	22,039	18,436	2,898	3,365	41,646	18,961	22,686	3,566	4,140	30,338	12,537	17,801	2,798	3,249
2	40,397	22,094	18,302	2,877	3,340	41,293	19,020	22,273	3,501	4,065	30,605	12,319	18,286	2,875	3,337
3	40,084	22,473	17,611	2,768	3,214	40,666	19,043	21,623	3,399	3,946	31,038	12,587	18,452	2,901	3,367
4	39,780	21,995	17,784	2,796	3,246	40,519	18,797	21,722	3,415	3,964	30,961	12,557	18,403	2,893	3,359
5	39,701	19,558	20,143	3,167	3,676	39,762	17,652	22,110	3,476	4,035	30,888	12,304	18,584	2,921	3,392
6	41,067	20,589	20,478	4,603	6,997	40,651	18,809	21,842	3,433	3,986	31,236	12,674	18,562	2,918	3,388
7	42,816	22,661	20,155	7,397	26,489	42,788	20,578	22,210	4,993	7,589	31,235	13,409	17,825	2,802	3,253
8	47,835	24,017	23,819	8,742	31,305	43,938	21,668	22,270	5,006	7,610	31,681	14,651	17,030	2,677	3,108
9	54,601	27,701	26,899	9,872	35,354	47,398	24,769	22,630	5,087	7,733	32,388	14,724	17,665	2,777	3,224
10	57,014	36,776	20,238	4,549	6,915	47,422	28,066	19,356	4,351	6,614	32,078	14,338	17,740	2,789	3,238
11	57,215	40,651	16,564	3,724	5,660	46,676	29,558	17,119	3,848	5,849	31,480	14,326	17,154	2,697	3,131
12	55,905	40,356	15,548	3,495	5,313	43,581	28,058	15,523	2,440	2,833	31,116	13,763	17,353	2,728	3,167
13	49,735	35,726	14,009	3,149	4,787	38,903	22,669	16,235	2,552	2,963	31,204	14,190	17,014	2,675	3,105
14	41,996	27,912	14,084	3,166	4,812	34,804	18,589	16,214	2,549	2,959	33,373	13,415	19,958	3,137	3,642
15	36,733	22,233	14,501	3,260	4,955	33,165	17,097	16,068	2,526	2,932	33,195	13,987	19,208	3,019	3,505
16	34,577	19,726	14,851	3,339	5,075	32,839	16,524	16,315	2,565	2,977	32,997	13,069	19,929	3,133	3,637
17	34,500	17,574	16,926	3,805	5,784	33,290	15,626	17,664	2,777	3,224	33,317	12,272	21,045	3,308	3,841
18	35,745	15,042	20,703	7,598	0	33,951	14,502	19,449	4,372	6,646	34,014	12,229	21,785	3,425	3,976
19	37,233	14,101	23,132	8,489	0	33,935	14,222	19,713	4,431	6,736	35,044	12,342	22,702	3,569	4,143
20	37,353	14,500	22,853	5,137	7,809	33,810	14,331	19,480	3,062	3,555	35,262	12,460	22,802	3,585	4,161
21	37,616	17,044	20,572	4,625	7,029	32,205	13,920	18,285	2,874	3,337	35,855	16,269	19,586	3,079	3,574
22	38,512	20,140	18,373	2,888	3,353	31,681	13,103	18,578	2,920	3,390	36,118	19,816	16,302	2,563	2,975
23	40,316	20,774	19,542	3,072	3,566	31,615	14,239	17,376	2,731	3,171	35,870	21,251	14,619	2,298	2,668

Table C-16: Summary of results for Mine H

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	1,021	454	108,277	185,365
Saturday	928	470	83,518	108,483
Sunday	782	447	70,220	81,521
Monthly	29,313	13,648	2,997,038	4,838,049

Mine I

Table C-17: Average weekday, Saturday and Sunday impact profiles for Mine I

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	16,290	9,592	6,697	1,053	1,222	16,221	9,637	6,584	1,035	1,202	16,341	9,643	6,697	1,053	1,222
1	16,208	9,735	6,473	1,018	1,181	16,179	9,656	6,523	1,025	1,190	16,426	9,729	6,697	1,053	1,222
2	16,238	9,774	6,464	1,016	1,180	16,228	9,691	6,536	1,027	1,193	16,512	9,797	6,715	1,056	1,225
3	16,233	9,798	6,434	1,012	1,174	16,337	9,723	6,614	1,040	1,207	16,587	9,818	6,770	1,064	1,235
4	16,256	9,851	6,405	1,007	1,169	16,427	9,767	6,660	1,047	1,215	16,605	9,795	6,810	1,071	1,243
5	16,242	9,864	6,378	1,003	1,164	16,516	9,745	6,771	1,064	1,236	16,618	9,802	6,816	1,072	1,244
6	16,322	9,788	6,534	1,469	2,233	16,554	9,711	6,843	1,076	1,249	15,727	9,719	6,008	944	1,096
7	16,272	9,649	6,623	2,431	8,705	16,475	9,707	6,769	1,522	2,313	15,498	9,627	5,871	923	1,072
8	16,252	9,647	6,604	2,424	8,681	16,441	9,656	6,785	1,525	2,318	15,459	9,554	5,905	928	1,078
9	16,063	9,666	6,396	2,348	8,407	15,844	9,491	6,353	1,428	2,171	15,310	9,506	5,804	912	1,059
10	15,897	9,631	6,266	1,409	2,141	15,249	9,215	6,034	1,356	2,062	15,282	9,483	5,799	912	1,058
11	15,748	9,566	6,182	1,390	2,112	15,681	8,989	6,692	1,504	2,287	15,189	9,350	5,838	918	1,065
12	15,845	9,496	6,349	1,427	2,170	15,771	9,271	6,500	1,022	1,186	15,009	9,289	5,720	899	1,044
13	15,863	9,371	6,492	1,459	2,218	15,865	9,293	6,572	1,033	1,199	14,812	9,261	5,551	873	1,013
14	15,911	9,335	6,576	1,478	2,247	15,892	9,269	6,623	1,041	1,209	14,711	9,188	5,523	868	1,008
15	15,837	9,260	6,576	1,478	2,247	15,070	9,256	5,814	914	1,061	14,574	9,075	5,499	864	1,004
16	14,170	9,339	4,830	1,086	1,651	15,452	9,291	6,161	968	1,124	14,657	9,189	5,468	860	998
17	14,212	9,398	4,813	1,082	1,645	15,934	9,336	6,598	1,037	1,204	14,951	8,867	6,084	956	1,110
18	14,298	9,373	4,924	1,807	6,473	15,661	9,371	6,290	1,414	2,149	15,278	9,182	6,096	958	1,113
19	14,690	9,502	5,188	1,904	6,819	14,757	9,439	5,319	1,196	1,817	14,928	9,354	5,573	876	1,017
20	15,135	9,555	5,579	1,254	1,907	14,802	9,507	5,294	832	966	15,507	9,365	6,142	966	1,121
21	15,656	9,574	6,081	1,367	2,078	15,010	9,512	5,498	864	1,003	15,558	9,408	6,150	967	1,122
22	16,147	9,645	6,501	1,022	1,187	15,486	9,617	5,868	923	1,071	15,496	9,540	5,956	936	1,087
23	16,255	9,696	6,558	1,031	1,197	16,093	9,688	6,406	1,007	1,169	15,486	9,609	5,877	924	1,073

Table C-18: Summary of results for Mine I

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	378	148	33,975	71,208
Saturday	380	152	26,902	34,802
Sunday	373	145	22,852	26,530
Monthly	11,327	4,444	946,471	1,811,915

Mine J

Table C-19: Average weekday, Saturday and Sunday impact profiles for Mine J

Hour	Weekday					Saturday					Sunday				
	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)	Baseline (kW)	Actual (kW)	Impact (kW)	Summer impact (R)	Winter impact (R)
0	41,747	30,142	11,605	1,824	2,118	40,188	27,619	12,569	1,976	2,294	39,289	20,957	18,332	2,882	3,346
1	42,230	30,107	12,122	1,906	2,212	41,419	27,846	13,573	2,134	2,477	37,152	20,693	16,458	2,587	3,004
2	42,974	29,921	13,053	2,052	2,382	41,358	27,653	13,705	2,154	2,501	36,519	20,815	15,704	2,469	2,866
3	42,950	29,441	13,509	2,124	2,465	41,269	26,929	14,340	2,254	2,617	37,025	20,564	16,461	2,588	3,004
4	42,681	28,746	13,935	2,191	2,543	41,250	26,566	14,684	2,308	2,680	36,975	20,209	16,766	2,636	3,060
5	42,362	27,512	14,849	2,334	2,710	41,306	25,255	16,051	2,523	2,929	36,643	20,268	16,376	2,574	2,989
6	41,919	27,255	14,664	3,296	5,011	41,025	25,714	15,312	2,407	2,794	36,550	20,354	16,197	2,546	2,956
7	42,036	29,944	12,092	4,438	15,894	42,302	28,741	13,561	3,049	4,634	36,766	20,771	15,995	2,514	2,919
8	43,938	32,658	11,279	4,140	14,825	43,732	31,064	12,668	2,848	4,329	36,829	21,359	15,470	2,432	2,823
9	46,079	35,447	10,631	3,902	13,974	44,752	32,258	12,494	2,809	4,269	36,751	20,836	15,915	2,502	2,905
10	47,139	36,882	10,257	2,306	3,505	46,188	32,725	13,463	3,026	4,600	36,580	20,864	15,716	2,471	2,868
11	47,520	37,318	10,202	2,293	3,486	46,007	31,712	14,295	3,214	4,885	36,749	20,951	15,798	2,483	2,883
12	48,017	36,042	11,975	2,692	4,092	43,926	29,926	14,000	2,201	2,555	36,217	20,475	15,743	2,475	2,873
13	46,861	33,566	13,295	2,989	4,543	41,406	27,670	13,736	2,159	2,507	35,045	20,652	14,393	2,263	2,627
14	43,929	29,646	14,283	3,211	4,881	39,841	25,486	14,355	2,257	2,620	35,404	20,454	14,951	2,350	2,728
15	41,149	27,725	13,424	3,018	4,587	39,253	24,093	15,161	2,383	2,767	36,171	20,749	15,422	2,424	2,815
16	40,779	26,744	14,035	3,155	4,796	39,076	24,113	14,963	2,352	2,731	35,890	20,532	15,357	2,414	2,803
17	40,219	26,263	13,955	3,137	4,769	38,864	23,729	15,136	2,379	2,762	35,792	20,195	15,596	2,452	2,846
18	40,078	25,966	14,111	5,179	18,547	38,978	23,198	15,780	3,547	5,392	36,312	20,356	15,956	2,508	2,912
19	40,606	25,491	15,115	5,547	19,866	39,230	22,319	16,911	3,802	5,778	35,723	20,332	15,391	2,419	2,809
20	40,933	25,408	15,525	3,490	5,305	39,440	22,304	17,136	2,694	3,127	36,293	21,136	15,157	2,383	2,766
21	40,952	27,037	13,915	3,128	4,755	39,426	21,747	17,679	2,779	3,226	37,153	23,852	13,302	2,091	2,428
22	41,034	27,766	13,267	2,086	2,421	39,304	21,335	17,969	2,825	3,279	38,979	26,079	12,899	2,028	2,354
23	41,350	28,701	12,648	1,988	2,308	38,471	20,882	17,589	2,765	3,210	39,827	27,910	11,916	1,873	2,175

Table C-20: Summary of results for Mine J

Average	Baseline (MWh)	Impact (MWh)	Summer impact (R)	Winter impact (R)
Weekday	1,029	314	72,427	151,995
Saturday	988	357	62,845	80,964
Sunday	883	371	58,364	67,757
Monthly	30,131	9,816	2,078,217	3,938,766