

# Supplementary Material

Table S1. Atmospheric emissions and electricity generation of 36 landfill facilities (the expressed values are total annual amounts).

Facilities name and location	CO <sub>2</sub> equivalent (kg)	NO <sub>x</sub> (kg)	SO <sub>2</sub> (kg)	CO (kg)	PM <sub>10</sub> (kg)	PM <sub>2.5</sub> (kg)	VOCs (kg)	Arsenic (kg)	Cadmium (kg)	Chromium (kg)	Copper (kg)	Lead (kg)	Mercury (kg)	Nickel (kg)	PAHs (B[a]peq)) (kg)	Dioxins and furans (TEQ) (kg)	Electricity generation (MWh)
EDL LFG (VIC) PTY LTD, Berwick - Narre Warren, VIC	1097000	27000	1600	55000	56	26	11000	0.005	2.50E-04	0.022	0.039	6.20E-04	0.02	0.029	0.041	1.00E-06	12046
EDL LFG (SA) PTY LTD, Wingfield 2 - Dry Creek, SA	940000	11000	1300	69000	77	35	15000	0.0068	3.40E-04	0.031	0.053	8.50E-04	0.029	0.039	0.06	1.40E-06	14824
EDL LFG (VIC) PTY LTD, Brooklyn - Brooklyn, VIC	707000	24000	54	48000	51	23	9300	0.0045	2.30E-04	0.02	0.035	5.60E-04	0.018	0.026	0.036	9.00E-07	11216
EDL LFG (VIC) PTY LTD, Broadmeadows - Campbellfield, VIC	952000	29000	1700	59000	62	28	11000	0.0055	2.80E-04	0.025	0.043	6.90E-04	0.021	0.032	0.044	1.10E-06	13299
EDL LFG (VIC) PTY LTD, Corio - Corio, VIC	484000	20000	3.9	40000	39	18	7700	0.0034	1.70E-04	0.016	0.027	4.30E-04	0.014	0.02	0.03	6.90E-07	7471
EDL LFG (VIC) PTY LTD, Clayton - Clayton South, VIC	5056000	140000	1100	290000	370	180	57000	0.031	0.0015	0.14	0.24	0.0039	0.1	0.18	0.22	6.20E-06	84204
EDL LFG (VIC) PTY LTD, Springvale - Springvale, VIC	791000	25000	14	50000	57	26	9700	0.005	2.50E-04	0.023	0.039	6.30E-04	0.018	0.029	0.038	1.00E-06	12116
EDL LFG (NSW) PTY LTD, Grange Avenue - Marsden Park, NSW	329000	9400	160	19000	23	10	3700	0.002	1.00E-04	0.0091	0.016	2.50E-04	0.0069	0.012	0.014	4.10E-07	5466
EDL LFG (NSW) PTY LTD, Eastern Creek - Eastern Creek, NSW	526000	16000	270	33000	37	17	6400	0.0033	1.60E-04	0.015	0.026	4.10E-04	0.012	0.019	0.025	6.60E-07	8891
EDL LFG (NSW) PTY LTD, Lucas Heights 1 - Menai, NSW	900000	27000	450	55000	65	30	11000	0.0058	2.90E-04	0.026	0.045	7.20E-04	0.02	0.033	0.041	1.20E-06	13973
EDL LFG (NSW) PTY LTD, Jack's Gully - Mount Annan, NSW	800000	56000	400	120000	58	27	9500	0.0052	2.60E-04	0.023	0.04	6.40E-04	0.018	0.03	0.037	1.00E-06	12837
EDL LFG (QLD) P/L, Browns Plains - Browns Plains, QLD	875000	25000	56	50000	64	29	9700	0.0057	2.80E-04	0.026	0.044	7.10E-04	0.081	0.033	0.038	1.10E-06	13732
EDL LFG (NSW) PTY LTD, Lucas Heights 2 - Menai, NSW	6381000	200000	3300	400000	470	220	77000	0.042	2.10E-03	0.19	0.32	5.20E-03	0.14	0.24	0.03	8.40E-06	101074
EDL LFG (SA) PTY LTD, Wingfield 1 - Wingfield, SA	1001000	10000	1.20E+03	66000	82	37	15000	0.0073	3.60E-04	0.033	0	9.10E-04	2.70E-02	0.042	0.056	1.40E-06	15786
EDL LFG (ACT) P/L, Mugga Lane - Symonston, ACT	2014000	53000	21000	110000	150	68	0	0.013	6.60E-04	0.059	0.1	0.0016	0.039	0.076	0.081	2.60E-06	31706
LMS ENERGY PTY LTD, Mornington Renewable Energy Facility - Rye, VIC	343000	1300	0.23	220	77	77	62	0.13	0.19	0.74	0.25	0.2	0.0025	2.5	0	9.50E-06	6226
LMS ENERGY PTY LTD, Eastern Creek 2 Renewable Energy Facility - Eastern Creek, NSW	3036000	42000	13000	130000	6800	6800	3900	0.07	0.09	0.37	0.12	0.1	0	1.2	0.39	0	57086
LMS ENERGY PTY LTD, Remount Renewable Energy Facility - Mowbray, TAS	456000	1700	0.3	290	100	100	81	0.17	0.24	0.97	0.32	0.27	0.0033	3.2	0	1.20E-05	8669
LMS ENERGY PTY LTD, NAWMA Renewable Energy Facility - Uleybury, SA	311000	1100	0.19	180	64	64	51	0.11	0.15	0.61	0.2	0.17	0.0021	2	0	7.90E-06	5773
LMS ENERGY PTY LTD, South Cardup Renewable Energy Facility - Whitby, WA	1656000	6100	1.1	1000	360	360	290	0.63	0.88	3.5	1.2	0.97	0.012	12	0	4.50E-05	29396
LMS ENERGY PTY LTD, Rochedale Renewable Energy Facility - Rochedale, QLD	2108	10000	190	25000	480	480	110	0.82	1.2	4.5	1.5	1.3	0.016	15	0.0019	5.90E-05	37549
LMS ENERGY PTY LTD, Swanbank Renewable Energy Facility - Swanbank, QLD	699000	3300	63	8000	160	160	36	0.27	0.37	1.5	0.49	0.41	0.0051	4.1	6.00E-04	1.90E-05	12758
LMS ENERGY PTY LTD, Stapylton Renewable Energy Facility - Stapylton, QLD	1122000	5300	100	13000	250	250	58	0.43	0.61	2.4	0.8	0.66	0.0083	8	9.80E-04	3.10E-05	20246
LMS ENERGY PTY LTD, Albury Renewable Energy Facility - Hamilton Valley, NSW	427000	6300	2000	20000	1000	1000	590	0.01	0.01	0.06	0.02	0.02	0.072	0.19	0.06	0	7494
LMS ENERGY PTY LTD, Atlas Renewable Energy Facility - Mirrabooka, WA	128000	480	0.086	83	29	29	23	0.05	0.07	0.28	0.092	0.077	9.60E-04	0.92	0	3.60E-06	2134
LMS ENERGY PTY LTD, Ballarat Renewable Energy Facility - Smythesdale, VIC	396000	1500	0.26	250	89	89	71	0.15	0.21	0.85	0.28	0.24	0.0029	2.8	0	1.10E-05	6904
LMS ENERGY PTY LTD, Awaba Renewable Energy Facility - Awaba, NSW	451000	6700	2100	21000	1100	1100	620	0.01	0.01	0.06	0.02	0.02	0	0.2	0.06	0	8250
LMS ENERGY PTY LTD, Birkdale Renewable Energy Facility - Birkdale, QLD	328000	1600	30	3800	73	73	17	0.13	0.18	0.7	0.23	0.19	0.0024	2.3	2.90E-04	9.00E-06	5919
LMS ENERGY PTY LTD, Bendigo Renewable Energy Facility - Eaglehawk, Bendigo, VIC	236000	880	0.16	150	53	53	42	0.091	0.13	0.5	0.17	0.14	0.0017	1.7	0	6.60E-06	4188
LMS ENERGY PTY LTD, Wyndham Renewable Energy Facility - Werribee, VIC	759000	2800	0.49	480	170	170	130	0.29	0.4	1.6	0.53	0.44	0.0055	5.3	0	2.10E-05	14363
LMS ENERGY PTY LTD, Wollert Renewable Energy Facility - Wollert, VIC	3244000	12000	2.1	2100	720	720	580	1.2	1.7	6.9	2.3	1.9	0.024	23	0	8.90E-05	58863
LMS ENERGY PTY LTD, Wyong Renewable Energy Facility - Jilliby, NSW	1059000	14000	4300	43000	2200	2200	1300	0.02	0.03	0.12	0.04	0.03	0	0.4	0.13	0	18899
LANDFILL GAS & POWER PTY. LTD., Red Hill - Red Hill, WA	1629000	76000	2900	380000	120	55	30000	0.011	5.30E-04	0.048	0.83	0.0013	0.056	0.061	0.12	2.10E-06	28697
LANDFILL GAS & POWER PTY. LTD., Tamala Park - Mindarie, WA	2678000	98000	3700	490000	200	90	39000	0.017	8.70E-04	0.078	0.14	0.0022	0.072	0.1	0.15	3.50E-06	42334
AGL ENERGY SERVICES PTY LIMITED, AGL Kemps Creek Landfill Cogeneration - Kemps Creek, NSW	651000	38000	16000	83000	800	800	0	0.42	0.59	2.3	0.78	0.65	0.0081	7.8	3	1.10E-04	13058
AGL ENERGY SERVICES PTY LIMITED, AGL Woy Woy Landfill - Woy Woy, NSW	474000	28000	12000	61000	590	590	0	0.31	0.43	1.7	0.57	0.47	0.0059	5.7	2.1	8.20E-05	7616

Table S2. Results of midpoint impact assessment and the amount of electricity generation for 36 different landfill facilities (the expressed values are total annual amounts).

Facilities name and location	Electricity generation	Fine particulate matter formation	Freshwater ecotoxicity	Global warming	Human carcinogenic toxicity	Human non-carcinogenic toxicity	Marine ecotoxicity	Ozone formation, Human health	Terrestrial acidification	Terrestrial ecotoxicity
Unit	MWh	kg PM2.5 eq	kg 1,4-DCB	kg CO <sub>2</sub> eq	kg 1,4-DCB	kg 1,4-DCB	kg 1,4-DCB	kg NO <sub>x</sub> eq	kg SO <sub>2</sub> eq	kg 1,4-DCB
EDL LFG (VIC) PTY LTD, Berwick - Narre Warren, VIC	1.20E+04	3.46E+03	3.01E-01	1.10E+06	2.02E+01	1.32E+03	4.11E+01	2.70E+04	1.13E+04	1.18E+05
EDL LFG (SA) PTY LTD, Wingfield 2 - Dry Creek, SA	1.48E+04	1.62E+03	4.12E-01	9.40E+05	2.75E+01	1.85E+03	5.65E+01	1.10E+04	5.26E+03	1.64E+05
EDL LFG (VIC) PTY LTD, Brooklyn - Brooklyn, VIC	1.12E+04	2.68E+03	2.70E-01	7.07E+05	1.81E+01	1.19E+03	3.69E+01	2.40E+04	8.69E+03	1.06E+05
EDL LFG (VIC) PTY LTD, Broadmeadows - Campbellfield, VIC	1.33E+04	3.71E+03	3.30E-01	9.52E+05	2.22E+01	1.42E+03	4.49E+01	2.90E+04	1.21E+04	1.28E+05
EDL LFG (VIC) PTY LTD, Corio - Corio, VIC	7.47E+03	2.22E+03	2.09E-01	4.84E+05	1.40E+01	9.10E+02	2.85E+01	2.00E+04	7.20E+03	8.22E+04
EDL LFG (VIC) PTY LTD, Clayton - Clayton South, VIC	8.42E+04	1.59E+04	3.97E+02	5.06E+06	5.25E+04	3.27E+04	1.28E+03	1.45E+05	5.15E+04	1.11E+06
EDL LFG (VIC) PTY LTD, Springvale - Springvale, VIC	1.21E+04	2.78E+03	2.97E-01	7.91E+05	2.00E+01	1.26E+03	4.04E+01	2.50E+04	9.01E+03	1.14E+05
EDL LFG (NSW) PTY LTD, Grange Avenue - Marsden Park, NSW	5.47E+03	1.09E+03	1.21E-01	3.29E+05	8.12E+00	4.96E+02	1.64E+01	9.40E+03	3.54E+03	4.59E+04
EDL LFG (NSW) PTY LTD, Eastern Creek - Eastern Creek, NSW	8.89E+03	1.86E+03	1.97E-01	5.26E+05	1.31E+01	8.36E+02	2.68E+01	1.60E+04	6.03E+03	7.60E+04
EDL LFG (NSW) PTY LTD, Lucas Heights 1 - Menai, NSW	1.40E+04	3.13E+03	3.40E-01	9.00E+05	2.27E+01	1.44E+03	4.62E+01	2.70E+04	1.02E+04	1.30E+05
EDL LFG (NSW) PTY LTD, Jack's Gully - Mount Annan, NSW	1.28E+04	6.30E+03	3.04E-01	8.00E+05	2.05E+01	1.29E+03	4.12E+01	5.60E+04	2.06E+04	1.16E+05
EDL LFG (QLD) P/L, Browns Plains - Browns Plains, QLD	1.37E+04	2.80E+03	4.15E-01	8.75E+05	2.69E+01	3.19E+03	6.68E+01	2.50E+04	9.06E+03	2.52E+05
EDL LFG (NSW) PTY LTD, Lucas Heights 2 - Menai, NSW	1.01E+05	2.32E+04	2.33E+00	6.38E+06	1.56E+02	1.03E+04	3.24E+02	2.00E+05	7.53E+04	9.22E+05
EDL LFG (SA) PTY LTD, Wingfield 1 - Wingfield, SA	1.58E+04	1.49E+03	1.40E-01	1.00E+06	2.90E+01	1.86E+03	1.74E+01	1.00E+04	4.80E+03	6.85E+04
EDL LFG (ACT) P/L, Mugga Lane - Symonston, ACT	3.17E+04	1.20E+04	7.49E-01	2.01E+06	5.11E+01	3.06E+03	1.01E+02	5.30E+04	4.01E+04	2.79E+05
LMS ENERGY PTY LTD, Mornington Renewable Energy Facility - Rye, VIC	6.23E+03	2.20E+02	5.97E+00	3.43E+05	1.35E+03	3.41E+04	5.93E+02	1.30E+03	4.68E+02	1.24E+06
LMS ENERGY PTY LTD, Eastern Creek 2 Renewable Energy Facility - Eastern Creek, NSW	5.71E+04	1.52E+04	3.01E+00	3.04E+06	6.63E+02	1.75E+04	2.90E+02	4.20E+04	2.81E+04	5.92E+05
LMS ENERGY PTY LTD, Remount Renewable Energy Facility - Mowbray, TAS	8.67E+03	2.87E+02	7.65E+00	4.56E+05	1.73E+03	4.44E+04	7.59E+02	1.70E+03	6.12E+02	1.58E+06
LMS ENERGY PTY LTD, NAWMA Renewable Energy Facility - Uleybury, SA	5.77E+03	1.85E+02	4.78E+00	3.11E+05	1.08E+03	2.83E+04	4.74E+02	1.10E+03	3.96E+02	9.91E+05
LMS ENERGY PTY LTD, South Cardup Renewable Energy Facility - Whitby, WA	2.94E+04	1.03E+03	2.86E+01	1.66E+06	6.47E+03	1.63E+05	2.84E+03	6.10E+03	2.20E+03	5.93E+06
LMS ENERGY PTY LTD, Rochedale Renewable Energy Facility - Rochedale, QLD	3.75E+04	1.64E+03	3.59E+01	2.11E+03	8.11E+03	2.16E+05	3.56E+03	1.00E+04	3.79E+03	7.45E+06
LMS ENERGY PTY LTD, Swanbank Renewable Energy Facility - Swanbank, QLD	1.28E+04	5.41E+02	1.04E+01	6.99E+05	2.25E+03	6.94E+04	1.04E+03	3.30E+03	1.25E+03	2.21E+06
LMS ENERGY PTY LTD, Stapylton Renewable Energy Facility - Stapylton, QLD	2.02E+04	8.62E+02	1.91E+01	1.12E+06	4.32E+03	1.12E+05	1.90E+03	5.30E+03	2.01E+03	3.96E+06
LMS ENERGY PTY LTD, Albury Renewable Energy Facility - Hamilton Valley, NSW	7.49E+03	2.27E+03	5.73E-01	4.27E+05	1.09E+02	4.61E+03	7.16E+01	6.30E+03	4.27E+03	2.40E+05
LMS ENERGY PTY LTD, Atlas Renewable Energy Facility - Mirrabooka, WA	2.13E+03	8.18E+01	2.20E+00	1.28E+05	4.97E+02	1.30E+04	2.18E+02	4.80E+02	1.73E+02	4.56E+05
LMS ENERGY PTY LTD, Ballarat Renewable Energy Facility - Smythesdale, VIC	6.90E+03	2.54E+02	6.69E+00	3.96E+05	1.51E+03	3.92E+04	6.64E+02	1.50E+03	5.40E+02	1.39E+06
LMS ENERGY PTY LTD, Awaba Renewable Energy Facility - Awaba, NSW	8.25E+03	2.45E+03	4.94E-01	4.51E+05	1.09E+02	2.53E+03	4.78E+01	6.70E+03	4.51E+03	9.74E+04
LMS ENERGY PTY LTD, Birkdale Renewable Energy Facility - Birkdale, QLD	5.92E+03	2.58E+02	5.51E+00	3.28E+05	1.25E+03	3.33E+04	5.46E+02	1.60E+03	6.06E+02	1.14E+06
LMS ENERGY PTY LTD, Bendigo Renewable Energy Facility - Eaglehawk, Bendigo, VIC	4.19E+03	1.50E+02	4.06E+00	2.36E+05	9.18E+02	2.37E+04	4.03E+02	8.80E+02	3.17E+02	8.41E+05
LMS ENERGY PTY LTD, Wyndham Renewable Energy Facility - Werribee, VIC	1.44E+04	4.78E+02	1.27E+01	7.59E+05	2.86E+03	7.47E+04	1.26E+03	2.80E+03	1.01E+03	2.63E+06
LMS ENERGY PTY LTD, Wollert Renewable Energy Facility - Wollert, VIC	5.89E+04	2.04E+03	5.49E+01	3.24E+06	1.24E+04	3.14E+05	5.45E+03	1.20E+04	4.32E+03	1.14E+07
LMS ENERGY PTY LTD, Wyong Renewable Energy Facility - Jilliby, NSW	1.89E+04	4.99E+03	9.99E-01	1.06E+06	2.19E+02	5.25E+03	9.66E+01	1.40E+04	9.34E+03	1.97E+05
LANDFILL GAS & POWER PTY. LTD., Red Hill - Red Hill, WA	2.87E+04	9.26E+03	2.16E+02	1.63E+06	2.81E+04	1.68E+04	1.20E+03	7.85E+04	3.03E+04	1.81E+06
LANDFILL GAS & POWER PTY. LTD., Tamala Park - Mindarie, WA	4.23E+04	1.19E+04	2.69E+02	2.68E+06	3.56E+04	2.17E+04	8.52E+02	1.01E+05	3.90E+04	7.12E+05
AGL ENERGY SERVICES PTY LIMITED, AGL Kemps Creek Landfill Cogeneration - Kemps Creek, NSW	1.31E+04	9.62E+03	1.97E+01	6.51E+05	4.31E+03	1.09E+05	1.90E+03	3.80E+04	2.97E+04	3.86E+06
AGL ENERGY SERVICES PTY LIMITED, AGL Woy Woy Landfill - Woy Woy, NSW	7.62E+03	7.15E+03	1.43E+01	4.74E+05	3.14E+03	8.00E+04	1.38E+03	2.80E+04	2.21E+04	2.82E+06
Total	7.55E+05	1.55E+05	1.13E+03	4.29E+07	1.70E+05	1.49E+06	2.77E+04	1.04E+06	4.60E+05	5.52E+07

Table S3. Environmental impacts in midpoint categories for electricity generation from landfill gas, incineration, black coal and brown coal per MWh basis.

Impact category	Unit	Landfill gas	Incineration	Black coal*	Brown coal*
Fine particulate matter formation	kg PM <sub>2.5</sub> eq	2.10E-01	1.43E-01	9.96E-01	1.08E+00
Freshwater ecotoxicity	kg 1,4-DCB	9.62E-04	5.01E-06	4.2E-03	8.0E-04
Freshwater eutrophication	kg P eq	0	0	1.40E-05	8.50E-06
Global warming	kg CO <sub>2</sub> eq	5.83E+01	5.95E+02	8.79E+02	1.22E+03
Human carcinogenic toxicity	kg 1,4-DCB	1.66E-01	1.55E-05	2.8E-02	2.09E-01
Human non-carcinogenic toxicity	kg 1,4-DCB	2.63E+00	3.63E-04	1.23E+00	2.52E+00
Marine ecotoxicity	kg 1,4-DCB	4.65E-02	1.83E-05	1.50E-02	3.4E-02
Marine eutrophication	kg N eq	0	0	1.50E-04	8.2E-06
Ozone formation, Human health	kg NO <sub>x</sub> eq	1.32E+00	1.24E+00	3.31E+00	3.51E+00
Ozone formation, Terrestrial ecosystems	kg NO <sub>x</sub> eq	1.32E+00	1.24E+00	1.81E+00	1.47E+00
Terrestrial acidification	kg SO <sub>2</sub> eq	6.18E-01	4.74E-01	1.81E+00	1.47E+00
Terrestrial ecotoxicity	kg 1,4-DCB	9.63E+01	1.75E-02	8.68E+01	1.13E+02

\* The environmental impacts of electricity generation from black coal and brown coal were adopted from the study conducted by Strezov and Cho (2020).

Table S4. Environmental impacts in endpoint categories of electricity generation from landfill gas, incineration, black coal and brown coal per MWh basis.

Impact category	Unit	Landfill gas	Incineration	Black coal*	Brown coal*
Global warming, Human health	DALY	5.28E-05	5.52E-04	8.20E-04	1.10E-03
Human carcinogenic toxicity	DALY	7.46E-07	4.61E-11	8.70E-08	6.90E-07
Human non-carcinogenic toxicity	DALY	4.48E-07	8.26E-11	1.70E-07	5.70E-07
Fine particulate matter formation	DALY	1.29E-04	9.02E-05	6.30E-04	6.50E-04
Ozone formation, Human health	DALY	1.25E-06	1.12E-06	1.70E-06	1.30E-06
Global warming, Terrestrial ecosystems	species.yr	1.59E-07	1.67E-06	2.50E-06	3.40E-06
Terrestrial acidification	species.yr	1.29E-07	1.00E-07	7.00E-07	7.40E-07
Terrestrial ecotoxicity	species.yr	8.35E-10	1.99E-13	9.90E-10	1.30E-09
Ozone formation, Terrestrial ecosystems	species.yr	1.79E-07	1.59E-07	2.30E-07	1.90E-07
Global warming, Freshwater ecosystems	species.yr	4.35E-12	4.55E-11	6.70E-11	9.40E-11
Freshwater ecotoxicity	species.yr	1.03E-12	3.14E-15	2.90E-12	5.60E-13
Freshwater eutrophication	species.yr	0.00E+00	0.00E+00	9.50E-12	5.70E-12
Marine ecotoxicity	species.yr	3.86E-12	1.73E-15	1.60E-12	3.60E-12

\* The environmental impacts of electricity generation from black coal and brown coal were adopted from the study conducted by Strezov and Cho (2020).