

Supplementary file for:

Lesotho electricity demand profile from 2010 to 2030

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MAED model input tables and data

1. Demography

Table 1–1: Demographic overview

Item	Unit	2010	2015	2020	2025	2030
Population*	million	1.991	2.135	2.257	2.373	2.485
Pop. gr. rate*	%p.a.		1.402	1.124	1.005	0.931
Urban pop.	%	25.500	25.500	25.500	25.500	25.500
Capita/hh	cap	2.980	2.980	2.980	2.980	2.980
Households	million	0.170	0.183	0.193	0.203	0.213
Rural pop.	%	74.500	74.500	74.500	74.500	74.500
Capita/hh	cap	4.420	4.420	4.420	4.420	4.420
Households	million	0.336	0.360	0.380	0.400	0.419
Potential lf	%	64.000	64.000	64.000	64.000	64.000
Participating lf	%	65.000	65.000	65.000	65.000	65.000
Active lf	million	0.828	0.888	0.939	0.987	1.034
Share of lc. pop.	%	22.000	22.000	22.000	22.000	22.000
Pop. inside lc	million	0.438	0.470	0.497	0.522	0.547

2. GDP formation

Table 2–1: Total GDP and GDP structure by main economic sectors

Item	Unit	2010	2015	2020	2025	2030
GDP*	10⁹ USD	1.710	2.080	2.531	3.080	3.747
GDP gr. rate*	%p.a.		4.000	4.000	4.000	4.000
GDP/cap	USD	858.9	974.7	1121.4	1297.8	1507.5
Agriculture	%	7.804	7.804	7.804	7.804	7.804
Construction	%	5.555	5.555	5.555	5.555	5.555
Mining	%	4.413	4.413	4.413	4.413	4.413
Manufacturing	%	16.277	16.277	16.277	16.277	16.277
Service	%	61.850	61.850	61.850	61.850	61.850
Energy	%	4.101	4.101	4.101	4.101	4.101

Table 2–2: GDP formation by sector/subsector (absolute values)

Item	Unit	2010	2015	2020	2025	2030
Agriculture	10⁹ USD	0.133	0.162	0.198	0.240	0.292
Construction	10⁹ USD	0.095	0.116	0.141	0.171	0.208
Mining	10⁹ USD	0.075	0.092	0.112	0.136	0.165
Manufacturing	10⁹ USD	0.278	0.339	0.412	0.501	0.610
Service	10⁹ USD	1.058	1.287	1.566	1.905	2.317
Energy	10⁹ USD	0.070	0.085	0.104	0.126	0.154
Total GDP	10⁹ USD	1.710	2.080	2.531	3.080	3.747

Table 2–3: GDP formation by sector (per capita)

item	Unit	2010	2015	2020	2025	2030
GDP/cap	USD	858.865	974.673	1121.384	1297.797	1507.477
Agriculture	USD	67.026	76.063	87.513	101.280	117.643
Construction	USD	47.710	54.143	62.293	72.093	83.740
Mining	USD	37.902	43.012	49.487	57.272	66.525
Manufacturing	USD	139.797	158.648	182.528	211.242	245.372
Service	USD	531.208	602.835	693.576	802.687	932.374
Energy	USD	35.222	39.971	45.988	53.223	61.822

Table 2–4: GDP formation by sector/subsector (growth rates)

Item	Unit	2010	2015	2020	2025	2030
Agriculture	%		4.000	4.000	4.000	4.000
Construction	%		4.000	4.000	4.000	4.000
Mining	%		4.000	4.000	4.000	4.000
Manufacturing	%		4.000	4.000	4.000	4.000
Service	%		4.000	4.000	4.000	4.000
Energy	%		4.000	4.000	4.000	4.000
Total GDP	%		4.000	4.000	4.000	4.000
GDP/cap	%		2.562	2.844	2.965	3.041

3. Energy intensities

Table 3–1: Energy intensities for motor fuels

Item	Unit	2010	2015	2020	2025	2030
Agriculture	kWh/USD	0.268	0.268	0.268	0.268	0.268
Construction	kWh/USD	0.068	0.068	0.068	0.068	0.068
Mining	kWh/USD	1.285	1.285	1.285	1.285	1.285
Manufacturing	kWh/USD	0.425	0.425	0.425	0.425	0.425

Table 3–2: Energy intensities of electricity specific uses

Item	Unit	2010	2015	2020	2025	2030
Agriculture	kWh/USD	0.013	0.009	0.009	0.009	0.009
Construction	kWh/USD	0.183	0.163	0.163	0.163	0.163
Mining	kWh/USD	0.808	0.908	0.908	0.908	0.908
Manufacturing	kWh/USD	0.292	0.192	0.192	0.192	0.192

Table 3–3: Energy intensities of thermal uses

Item	Unit	2010	2015	2020	2025	2030
Agriculture	kWh/USD	0.020	0.011	0.011	0.011	0.011
Construction	kWh/USD	0.018	0.018	0.018	0.018	0.018
Mining	kWh/USD	0.686	0.686	0.686	0.686	0.686
Manufacturing	kWh/USD	6.836	5.836	5.836	5.836	5.836

4. Useful energy demand in industry

Table 4–1: Useful energy demand for motor fuels

Item	Unit	2010	2015	2020	2025	2030
Agriculture	GWyr	0.004	0.005	0.006	0.007	0.009
Construction	GWyr	0.001	0.001	0.001	0.001	0.002
Mining	GWyr	0.011	0.013	0.016	0.020	0.024
Manufacturing	GWyr	0.014	0.016	0.020	0.024	0.030
Total	GWyr	0.029	0.036	0.044	0.053	0.064

Table 4–2: Useful energy demand for electricity specific uses

Item	Unit	2010	2015	2020	2025	2030
Agriculture	GWyr	0.000	0.000	0.000	0.000	0.000
Construction	GWyr	0.002	0.002	0.003	0.003	0.004
Mining	GWyr	0.007	0.010	0.012	0.014	0.017
Manufacturing	GWyr	0.009	0.007	0.009	0.011	0.013
Total	GWyr	0.018	0.019	0.023	0.029	0.035

Table 4–3: Useful energy demand for thermal uses

Item	Unit	2010	2015	2020	2025	2030
Agriculture	GWyr	0.000	0.000	0.000	0.000	0.000
Construction	GWyr	0.000	0.000	0.000	0.000	0.000
Mining	GWyr	0.006	0.007	0.009	0.011	0.013
Manufacturing	GWyr	0.217	0.226	0.274	0.334	0.406
Total	GWyr	0.224	0.233	0.284	0.345	0.420

Table 4–4: Useful energy demand in industry

Item	Unit	2010	2015	2020	2025	2030
Agriculture	GWyr	0.005	0.005	0.007	0.008	0.010
Construction	GWyr	0.003	0.003	0.004	0.005	0.006
Mining	GWyr	0.024	0.030	0.037	0.045	0.054
Manufacturing	GWyr	0.240	0.249	0.303	0.369	0.449
Total	GWyr	0.271	0.288	0.351	0.427	0.519

5. Factors for manufacturing

Table 5–1: Shares of useful thermal energy demand in manufacturing

Manufacturing	Unit	2010	2015	2020	2025	2030
Steam generation	%	79.266	77.266	77.266	77.266	77.266
Furnace/direct heat	%	0.734	0.764	0.764	0.764	0.764
Space & water heating	%	20.000	21.970	21.970	21.970	21.970

Table 5–2: Useful thermal energy demand in manufacturing

Manufacturing	Unit	2010	2015	2020	2025	2030
Steam generation	GWyr	0.172	0.174	0.212	0.258	0.314
Furnace/direct heat	GWyr	0.002	0.002	0.002	0.003	0.003
Space&water heating	GWyr	0.043	0.050	0.060	0.073	0.089
Total	GWyr	0.217	0.226	0.274	0.334	0.406

6. Useful energy demand in urban household sector

Table 6–1: Basic data for useful energy demand in urban household sector

Item	Unit	2010	2015	2020	2025	2030
Dwellings	million	0.170	0.183	0.193	0.203	0.213
Share of dw. requiring SH	%	100.000	100.000	100.000	100.000	100.000
Degree-days	days°C	1775.000	1775.000	1775.000	1775.000	1775.000

Table 6–2: Dwelling factors for space heating and air conditioning, urban household

Item		2010	2015	2020	2025	2030
Share of Malaene	%	41.100	41.100	41.100	41.100	41.100
Share of Family house	%	58.900	58.900	58.900	58.900	58.900
Dw. size. Malaene	sqm	30.000	30.000	30.000	30.000	30.000
Dw. size. Family house	sqm	100.000	100.000	100.000	100.000	100.000
Area h. Malaene	%	75.000	75.000	75.000	75.000	75.000
Area h. Family house	%	55.000	55.000	55.000	55.000	55.000
H. los. R. Malaene	Wh/sqm/°C/h	16.000	16.000	16.000	16.000	16.000
H. los. R. Family house	Wh/sqm/°C/h	15.000	15.000	15.000	15.000	15.000
Dw. AC. Malaene	%	0.000	0.000	0.000	0.000	0.000
Dw. AC. Family house	%	3.000	3.000	3.000	3.000	3.000
Spc. req. AC. Malaene	kWh/dw/yr	0.000	0.000	0.000	0.000	0.000
Spc. req. AC. Family house	kWh/dw/yr	7254.000	7254.000	7254.000	7254.000	7254.000

Table 6–3: Dwelling factors for cooking, hot water and appliances, urban households

Item	Unit	2010	2015	2020	2025	2030
Cooking	kWh/dw/yr	900.377	900.377	900.377	900.377	900.377
Dw with hot water	%	30.000	30.000	35.000	45.000	45.000
HW per cap	kWh/cap/yr	180.154	180.154	180.154	180.154	180.154
Electr. cons. for appliances	kWh/dw/yr	800.910	800.910	800.910	800.910	800.910
Electr. penetration	%	54.087	95.000	100.000	100.000	100.000
FF for lighting	kWh/dw/yr	0.000	0.000	0.000	0.000	0.000

Table 6–4: Calculation of useful energy demand in urban household sector

Item	Unit	2010	2015	2020	2025	2030
Space heating	GWyr	0.525	0.563	0.595	0.626	0.656
Water heating	GWyr	0.003	0.003	0.004	0.006	0.006
Cooking	GWyr	0.018	0.019	0.020	0.021	0.022
Air conditioning	GWyr	0.002	0.003	0.003	0.003	0.003
Elec. for appliances	GWyr	0.008	0.016	0.018	0.019	0.019
FF for lighting	GWyr	0.000	0.000	0.000	0.000	0.000
Total	GWyr	0.557	0.604	0.640	0.674	0.706

Table 6–5: Penetration of energy forms into space heating, urban household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	4.933	4.933	4.933	4.933	4.933
Modern biomass	%	0.000	0.000	0.000	0.000	0.000
Electricity	%	0.312	0.212	0.162	0.112	0.062
(thereof: heat pump)	%	0.000	0.000	0.000	0.000	0.000
District heat	%	0.000	0.000	0.000	0.000	0.000
Soft solar	%	0.000	0.000	0.000	0.000	0.000
Fossil fuels	%	94.8	94.9	94.9	95.0	95.0

Table 6–6: Efficiencies and other factors for space heating, urban household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	30.612	30.612	30.612	30.612	30.612
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	88.861	88.861	88.861	88.861	88.861
COP heat pumps	ratio	1.000	1.000	1.000	1.000	1.000
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 6–7: Penetration of energy forms into water heating, urban household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	0.000	0.000	0.000	0.000	0.000
Modern biomass	%	0.000	0.000	0.000	0.000	0.000
Electricity	%	100.000	100.000	100.000	100.000	100.000
(thereof: heat pump)	%	0.000	0.000	0.000	0.000	0.000
District heat	%	0.000	0.000	0.000	0.000	0.000
Soft solar	%	0.000	0.000	0.000	0.000	0.000
Fossil fuels	%	0.0	0.0	0.0	0.0	0.0

Table 6–8: Efficiencies and other factors for water heating, urban household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	1.000	1.000	1.000	1.000	1.000
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	1.000	1.000	1.000	1.000	1.000
COP heat pumps	ratio	1.000	1.000	1.000	1.000	1.000
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 6–9: Penetration of energy forms into cooking, urban household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	8.673	8.673	8.673	8.673	8.673
Modern biomass	%	0.000	0.000	0.000	0.000	0.000
Electricity	%	37.798	30.740	27.240	16.740	13.240
Soft solar	%	0.000	0.000	0.000	0.000	0.000
Fossil fuels	%	53.5	60.6	64.1	74.6	78.1

Table 6–10: Efficiencies and other factors for cooking, urban household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	21.053	21.053	21.053	21.053	21.053
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	76.754	76.754	76.754	76.754	76.754
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 6–11: Penetration into air conditioning by technology, urban household

Item		2010	2015	2020	2025	2030
Electricity	%	100.000	100.000	100.000	100.000	100.000
Non-electric	%	0.00	0.00	0.00	0.00	0.00

Table 6–12: Efficiencies for air conditioning, urban household

Item		2010	2015	2020	2025	2030
COP electric AC	ratio	2.500	2.500	2.500	2.500	2.500
COP non-electric AC	ratio	2.500	2.500	2.500	2.500	2.500

7. Useful energy demand in rural household sector

Table 7–1: Basic data for useful energy demand in rural household sector

Item	Unit	2010	2015	2020	2025	2030
Dwellings	million	0.336	0.360	0.380	0.400	0.419
Share of dw. requiring SH	%	100.000	100.000	100.000	100.000	100.000
Degree-days	days°C	1775.000	1775.000	1775.000	1775.000	1775.000

Table 7–2: Dwelling factors for space heating and air conditioning, rural household

Item		2010	2015	2020	2025	2030
Share of Mudhouse/hut	%	100.000	100.000	100.000	100.000	100.000
Dw. size. Mudhouse/hut	sqm	20.000	20.000	20.000	20.000	20.000
Area h. Mudhouse/hut	%	100.000	100.000	100.000	100.000	100.000
H. los. R. Mudhouse/hut	Wh/sqm/°C/h	6.300	6.300	6.300	6.300	6.300
Dw. AC. Mudhouse/hut	%	0.000	0.000	0.000	0.000	0.000
Spc. req. AC. Mudhouse/hut	kWh/dw/yr	0.000	0.000	0.000	0.000	0.000

Table 7–3: Dwelling factors for cooking, hot water and appliance, rural household

Item	Unit	2010	2015	2020	2025	2030
Cooking	kWh/dw/yr	4792.217	4792.217	4792.217	4792.217	4792.217
Dw with hot water	%	0.000	0.000	0.000	0.000	0.000
HW per cap	kWh/cap/yr	0.000	0.000	0.000	0.000	0.000
Electr. cons. for appliances	kWh/dw/yr	250.771	250.771	250.771	250.771	250.771
Electr. penetration	%	1.816	5.497	10.000	12.000	15.000
FF for lighting	kWh/dw/yr	140.806	140.806	140.806	140.806	140.806

Table 7–4: Calculation of useful energy demand in rural household sector

Item	Unit	2010	2015	2020	2025	2030
Space heating	GWyr	0.206	0.220	0.233	0.245	0.257
Water heating	GWyr	0.000	0.000	0.000	0.000	0.000
Cooking	GWyr	0.184	0.197	0.208	0.219	0.229
Air conditioning	GWyr	0.000	0.000	0.000	0.000	0.000
Elec. for appliances	GWyr	0.000	0.001	0.001	0.001	0.002
FF for lighting	GWyr	0.005	0.005	0.006	0.006	0.006
Total	GWyr	0.395	0.423	0.448	0.471	0.493

Table 7–5: Penetration of energy forms into space heating, rural household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	73.063	73.063	73.063	73.063	73.063
Modern biomass	%					
Electricity	%					
(thereof: heat pump)	%					
District heat	%					
Soft solar	%					
Fossil fuels	%	26.9	26.9	26.9	26.9	26.9

Table 7–6: Efficiencies and other factors for space heating, rural household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	30.612	30.612	30.612	30.612	30.612
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	94.558	94.558	94.558	94.558	94.558
COP heat pumps	ratio	1.000	1.000	1.000	1.000	1.000
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 7–7: Penetration of energy forms into water heating, rural household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	0.000	0.000	0.000	0.000	0.000
Modern biomass	%	0.000	0.000	0.000	0.000	0.000
Electricity	%	0.000	0.000	0.000	0.000	0.000
(thereof: heat pump)	%	0.000	0.000	0.000	0.000	0.000
District heat	%	0.000	0.000	0.000	0.000	0.000
Soft solar	%	0.000	0.000	0.000	0.000	0.000
Fossil fuels	%	100.0	100.0	100.0	100.0	100.0

Table 7–8: Efficiencies and other factors for water heating, rural household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	1.000	1.000	1.000	1.000	1.000
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	1.000	1.000	1.000	1.000	1.000
COP heat pumps	ratio	1.000	1.000	1.000	1.000	1.000
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 7–9: Penetration of energy forms into cooking, rural household

Item		2010	2015	2020	2025	2030
Traditional fuels	%	67.450	67.450	67.450	67.450	67.450
Modern biomass	%					
Electricity	%	0.038	0.038	0.038	0.038	0.038
Soft solar	%					
Fossil fuels	%	32.5	32.5	32.5	32.5	32.5

Table 7–10: Efficiencies and other factors for cooking, rural household

Item		2010	2015	2020	2025	2030
Eff. Trad. fuels	%	21.053	21.053	21.053	21.053	21.053
Eff. Mod. biomass	%	1.000	1.000	1.000	1.000	1.000
Eff. Fossil fuels	%	91.228	91.228	91.228	91.228	91.228
Solar share	%	1.000	1.000	1.000	1.000	1.000

Table 7–11: Penetration into air conditioning by technology, rural household

Item		2010	2015	2020	2025	2030
Electricity	%	100.000	100.000	100.000	100.000	100.000
Non-electric	%	0.00	0.00	0.00	0.00	0.00

Table 7–12: Efficiencies for air conditioning, rural household

Item		2010	2015	2020	2025	2030
COP electric AC	ratio	2.500	2.500	2.500	2.500	2.500
COP non-electric AC	ratio	2.500	2.500	2.500	2.500	2.500

8. Useful energy demand in service sector

Table 8–1: Basic data for useful energy demand in service sector

Item	Unit	2010	2015	2020	2025	2030
Labour force in SS	%	60.000	60.000	60.000	60.000	60.000
Floor area per emp.	sqm/cap	8.000	8.000	8.000	8.000	8.000
Labour force in SS	million	0.497	0.533	0.563	0.592	0.620
Floor area of SS	million sqm	3.976	4.262	4.507	4.738	4.963

Table 8–2: Factors for space heating and air conditioning

Item		2010	2015	2020	2025	2030
Share of area req. SH	%	75.000	75.000	75.000	75.000	75.000
Area actually heated	%	80.000	80.000	80.000	80.000	80.000
Specific SH req.	kWh/sqm/yr	1873.534	1873.53 4	1873.53 4	1873.53 4	1873.53 4
Air cond. floor area	%	80.000	80.000	80.000	80.000	80.000
Specific cooling req.	kWh/sqm/yr	45.200	31.534	31.534	31.534	31.534

Table 8–3: Useful energy demand for space heating and air conditioning

Item		2010	2015	2020	2025	2030
Total area heated	million sqm	2.385	2.557	2.704	2.843	2.978
Space heating	GWyr	0.510	0.547	0.578	0.608	0.637
Air conditioning	GWyr	0.016	0.012	0.013	0.014	0.014

9. Energy intensities for end-users other than space heating and air conditioning

Table 9–1: Energy intensities of motor fuels

Item		2010	2015	2020	2025	2030
Service	kWh/USD	0.000	0.000	0.000	0.000	0.000

Table 9–2: Energy intensities of electricity specific uses

Item		2010	2015	2020	2025	2030
Service	kWh/USD	0.054	0.054	0.054	0.054	0.054

Table 9–3: Energy intensities of other thermal uses

Item		2010	2015	2020	2025	2030
Service	kWh/USD	2.154	2.154	2.154	2.154	2.154

10. Useful energy demand for end-users other than space heating and air conditioning

Table 10–1: Useful energy demand of motor fuels

Item		2010	2015	2020	2025	2030
Service	GWyr	0.000	0.000	0.000	0.000	0.000

Table 10–2: Useful energy demand of electricity specific uses

Item		2010	2015	2020	2025	2030
Service	GWyr	0.007	0.008	0.010	0.012	0.014

Table 10–3: Useful energy demand of other thermal uses

Item		2010	2015	2020	2025	2030
Service	GWyr	0.260	0.316	0.385	0.468	0.570

Table 10–4: Total useful energy demand in service sector

Item		2010	2015	2020	2025	2030
Space heating	GWyr	0.510	0.547	0.578	0.608	0.637
Air conditioning	GWyr	0.016	0.012	0.013	0.014	0.014
Motor fuels	GWyr	0.000	0.000	0.000	0.000	0.000
Electricity spec. uses	GWyr	0.007	0.008	0.010	0.012	0.014
Other thermal uses	GWyr	0.260	0.316	0.385	0.468	0.570
Total	GWyr	0.793	0.884	0.986	1.102	1.235