



CARBON FOOTPRINT
COUNTRY SPECIFIC ELECTRICITY GRID GREENHOUSE GAS EMISSION FACTORS
Last Updated: June 2020

COUNTRY SPECIFIC ELECTRICITY FACTORS – June 2020

The following grid electricity emissions factors are used in our online calculators. Countries and territories are ordered alphabetically and grouped by geographic area.

Grouping	Country	Production fuel mix factor (kgCO _{2e} per kWh)	Residual fuel mix factor (kgCO _{2e} per kWh)	Source	Year	Comments
Africa	South Africa	0.928	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
Asia	China (PR)	0.555	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Hong Kong (China)	0.8100 or 0.7000	-	Hong Kong Electric Company (2019) or CLP Group (2019) These two companies supply different areas of HK so check which one you need.	2019	Combined generation and T&D factor
	India	0.708	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Indonesia	0.761	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Japan	0.506	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Korea (Republic)	0.500	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
Australasia	Australia	Gen = 0.7900 T&D = 0.0900	-	Australian Government	2018	Published in August 2019
	New Zealand	Gen = 0.0074 T&D = 0.0977	-	Ministry for the Environment https://www.mfe.govt.nz/node/18670/	2019 (based on 2016 data)	Emission factors published in 2019, based on 2018 national inventory which is based on 2016 data.

Grouping	Country	Production fuel mix factor (kgCO ₂ e per kWh)	Residual fuel mix factor (kgCO ₂ e per kWh)	Source	Year	Comments
Middle East	Saudi Arabia	0.732	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Turkey	0.481	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	United Arab Emirates	0.4258	-	Dubai Electricity & Water Authority (sustainability report 2018)	2018	Generation factor only
North & Central America	Canada	0.13	-	UN Framework Convention on Climate Change	2020 (based on 2018 data)	Combined generation and distribution factor. Regional factors are available. See separate table below.
	Mexico	0.449	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	United States	0.45322	-	US Env Protection Agency (EPA) eGrid	2018	Combined generation and distribution factor. Regional factors are available. See separate table below.
South America	Argentina	0.313	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Brazil	0.074	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
Europe	Austria	0.142	-	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Belgium	0.167	0.18906	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Bulgaria	0.470	0.49543	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Croatia	0.417	0.56168	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Cyprus	0.639	0.77021	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Czech Republic	0.576	0.61230	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Denmark	0.209	0.50937	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Estonia	0.875	1.04329	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor

Grouping	Country	Production fuel mix factor (kgCO _{2e} per kWh)	Residual fuel mix factor (kgCO _{2e} per kWh)	Source	Year	Comments
	Finland	0.143	0.30164	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	France	0.047	0.05320	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Germany	0.469	0.72869	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Greece	0.641	0.69583	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Hungary	0.314	0.37898	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Iceland	0.000	0.48224	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Ireland	0.393	0.64035	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Italy	0.327	0.48723	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Latvia	0.313	0.32276	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Lithuania	0.362	0.38073	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Luxembourg	0.201	0.36121	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Malta	0.761	0.66892	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Netherlands	0.457	0.53339	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Norway	0.011	0.28049	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Poland	0.846	0.90462	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Portugal	0.307	0.31552	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Romania	0.401	0.40259	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Russian Federation	0.325	-	Climate Transparency (2019 Report)	2018	Emissions intensity of the power sector
	Slovakia	0.169	0.19395	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Slovenia	0.335	0.50223	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Spain	0.288	0.45091	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Sweden	0.012	0.03742	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	Switzerland	0.014	0.03485	Association of Issuing Bodies (AIB)	2018	Production & residual mix factor
	United Kingdom	Gen: 0.2556 T&D: 0.0217	0.38096	Production: UK Govt – Defra/BEIS	2019 (2018/19 Data)	Generation & transmission & distribution factors
				Residual: Association of Issuing Bodies (AIB)	2018	Combined residual mix factor

UNITED STATES REGIONAL FACTORS (BY STATE)

Regional factors are sourced directly from the United States Environmental Protection Agency's (EPA) eGrid database. 2018 factors were published in February 2020. **Next set due to be published in 2022.**

State	Grid	Generation Factor (kgCO ₂ e per kWh)	T&D Factor (kgCO ₂ e per kWh)	Year
UNITED STATES		0.43222	0.0203	2018 (published 2020)
Alaska (AK)	ASCC & ASCC Misc. - Alaska Grid	0.41367	0.0223	2018 (published 2020)
Alabama (AL)	SERC - South	0.39385	0.0202	2018 (published 2020)
Arkansas (AR)	SERC - South	0.55299	0.0284	2018 (published 2020)
Arizona (AZ)	WECC - Southwest	0.44100	0.0223	2018 (published 2020)
California (CA)	WECC- California	0.19143	0.0097	2018 (published 2020)
Colorado (CO)	WECC - Rockies	0.62204	0.0314	2018 (published 2020)
Connecticut (CT)	NPCC - New England	0.23110	0.0119	2018 (published 2020)
Washington DC (DC)	RFC - East	0.19961	0.0102	2018 (published 2020)
Delaware (DE)	RFC - East	0.40841	0.0210	2018 (published 2020)
Florida (FL)	FRCC - All	0.42988	0.0221	2018 (published 2020)
Georgia (GA)	SERC - South	0.42268	0.0217	2018 (published 2020)
Hawaii (HI)	HICC - Misc. & Oahu	0.69163	0.0375	2018 (published 2020)
Iowa (IA)	MRO - East	0.48868	0.0251	2018 (published 2020)
Idaho (ID)	WECC - Rockies	0.07289	0.0037	2018 (published 2020)
Illinois (IL)	MRO - East	0.37128	0.0191	2018 (published 2020)
Indiana (IN)	RFC - West	0.79312	0.0407	2018 (published 2020)
Kansas (KS)	SPP- North	0.45205	0.0232	2018 (published 2020)
Kentucky (KY)	SERC - Tennessee Valley	0.83264	0.0427	2018 (published 2020)
Louisiana (LA)	SERC - South	0.38076	0.0195	2018 (published 2020)
Massachusetts (MA)	NPCC - New England	0.33287	0.0171	2018 (published 2020)
Maryland (MD)	RFC - East	0.38155	0.0196	2018 (published 2020)
Maine (ME)	NPCC - New England	0.12166	0.0062	2018 (published 2020)
Michigan (MI)	RFC - Michigan	0.50610	0.0260	2018 (published 2020)
Minnesota (MN)	MRO - East	0.45500	0.0234	2018 (published 2020)

State	Grid	Generation Factor (kgCO _{2e} per kWh)	T&D Factor (kgCO _{2e} per kWh)	Year
UNITED STATES		0.43222	0.0203	2018 (published 2020)
Missouri (MO)	SERC - South	0.77695	0.0399	2018 (published 2020)
Mississippi (MS)	SERC - South	0.41709	0.0214	2018 (published 2020)
Montana (MT)	WECC - Rockies	0.52886	0.0267	2018 (published 2020)
North Carolina (NC)	SERC - Virginia/Carolinas	0.36472	0.0187	2018 (published 2020)
North Dakota (ND)	MRO-West	0.68803	0.0353	2018 (published 2020)
Nebraska (NE)	MRO-West	0.64298	0.0330	2018 (published 2020)
New Hampshire (NH)	NPCC - New England	0.13872	0.0071	2018 (published 2020)
New Jersey (NJ)	RFC - East	0.22777	0.0117	2018 (published 2020)
New Mexico (NM)	WECC - Southwest	0.60800	0.0307	2018 (published 2020)
Nevada (NV)	WECC - Rockies	0.33866	0.0171	2018 (published 2020)
New York (NY)	NPCC - LI, NYC, & Upstate NY	0.18991	0.0097	2018 (published 2020)
Ohio (OH)	RFC - West	0.60321	0.0310	2018 (published 2020)
Oklahoma (OK)	SPP- South	0.40523	0.0208	2018 (published 2020)
Oregon (OR)	WECC - Northwest	0.14250	0.0072	2018 (published 2020)
Pennsylvania (PA)	RFC - West	0.35781	0.0184	2018 (published 2020)
Rhode Island (RI)	NPCC - New England	0.39407	0.0202	2018 (published 2020)
South Carolina (SC)	SERC - Virginia/Carolinas	0.28783	0.0148	2018 (published 2020)
South Dakota (SD)	MRO-West	0.23586	0.0121	2018 (published 2020)
Tennessee (TN)	SERC - Tennessee Valley	0.33945	0.0174	2018 (published 2020)
Texas (TX)	ERCOT - All	0.44618	0.0228	2018 (published 2020)
Utah (UT)	WECC - Rockies	0.72999	0.0368	2018 (published 2020)
Virginia (VA)	SERC - Virginia/Carolinas	0.33695	0.0173	2018 (published 2020)
Vermont (VT)	NPCC - New England	0.02608	0.0013	2018 (published 2020)
Washington (WA)	WECC - Northwest	0.09074	0.0046	2018 (published 2020)
Wisconsin (WI)	MRO - East	0.63333	0.0325	2018 (published 2020)
West Virginia (WV)	SERC - Virginia/Carolinas	0.88970	0.0457	2018 (published 2020)
Wyoming (WY)	WECC - Rockies	0.93610	0.0472	2018 (published 2020)

CANADA REGIONAL FACTORS (BY PROVINCE)

Province factors sourced from Canada's latest submission to the UN Framework Convention on Climate Change (2019).

State	Generation Factor (kgCO ₂ e per kWh)	T&D Factor (kgCO ₂ e per kWh)	Year
Canada	0.12	0.01	2018 (published 2020)
Alberta (AB)	0.63	0.05	2018 (published 2020)
British Columbia (BC)	0.0123	0.0005	2018 (published 2020)
Manitoba (MT)	0.0013	0.0001	2018 (published 2020)
New Brunswick (NB)	0.39	0.01	2018 (published 2020)
Newfoundland and Labrador (NL)	0.026	0.001	2018 (published 2020)
Nova Scotia (NS)	0.72	0.04	2018 (published 2020)
Northwest Territories (NT)	0.16	Negligible	2018 (published 2020)
Nunavut (NU)	0.84	0.05	2018 (published 2020)
Ontario (ON)	0.029	0.001	2018 (published 2020)
Prince Edward Island (PE)	0.004	Unknown use 'New Brunswick'	2018 (published 2020)
Quebec (QC)	0.0013	0.0004	2018 (published 2020)
Saskatchewan (SK)	0.68	0.03	2018 (published 2020)
Yukon Territory (YT)	0.069	0.010	2018 (published 2020)

AUSTRALIA REGIONAL FACTORS (BY STATE)

State specific factors are sourced from publicly available emissions factors published by the Australian Government to support annual GHG measurements.

This was updated using the report published in August 2019 report. If the electricity is not sourced from a listed grid, Northern Territory emissions factor may be used.

State	Generation Factor (kgCO _{2e} per kWh)	T&D Factor (kgCO _{2e} per kWh)	Year
AUSTRALIA	0.79	0.09	2017/18 (published in 2019)
Australian Capital Territory	0.81	0.09	2017/18 (published in 2019)
New South Wales	0.81	0.09	2017/18 (published in 2019)
Northern Territory	0.63	0.08	2017/18 (published in 2019)
Northern Territory – Darwin Katherine Interconnected System (DKIS)	0.55	Not available	2017/18 (published in 2019)
Queensland	0.81	0.12	2017/18 (published in 2019)
South Australia	0.44	0.10	2017/18 (published in 2019)
Tasmania	0.15	0.02	2017/18 (published in 2019)
Victoria	1.02	0.10	2017/18 (published in 2019)
Western Australia – North Western Interconnected System (NWIS)	0.59	Not available	2017/18 (published in 2019)
Western Australia – South West Interconnected System (SWIS)	0.69	0.04	2017/18 (published in 2019)

Sources of Emissions Factors:

- **AIB (2019). 2018 European Residual Mix Factors.** Version 1.4 (July 2019) <https://www.aib-net.org/facts/european-residual-mix>
- **Australian Government Dept of Environment & Energy Emissions Factors**
 - Table 5 and Table 44 for regional factors (Aug 2019 report) – <https://publications.industry.gov.au/publications/climate-change/system/files/resources/cf1/national-greenhouse-accounts-factors-august-2019.pdf>
- **Climate Transparency (2019)** – Country profiles from ‘G20 Brown to Green Report 2019’ (Nov 2019) - <https://www.climate-transparency.org/wp-content/uploads/2019/11/Brown-to-Green-Report-2019.pdf>
- **Defra/BEIS 2019 Emissions Factors** - <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>
- **UK Residual Mix Factor** - (Updated: Aug 2019) - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/822503/fuel-mix-disclosure-data-2018-2019.pdf
- **Dubai Electricity & Water Authority (DEWA) (2018)** - page 81 https://www.dewa.gov.ae/~media/Files/Custom/Sustainability%20Reports/DEWA%20Sustainability%20Report%202018_EN.ashx
- **Hong Kong**
 - Power generation is managed by two major companies: Hong Kong Electric Company (supplies HK Island and Lamma Island) and CLP Power Hong Kong Ltd (supplies Kowloon, New Territories and outlying islands except Lamma Island). https://en.wikipedia.org/wiki/Electricity_sector_in_Hong_Kong
 - HK Electric (<https://www.hkelectric.com/en/corporate-social-responsibility/sustainability-reports>)
 - 2019 sustainability report, page 71 – “CO₂e per electricity sold (kg/kWh)” https://www.hkelectric.com/en/CorporateSocialResponsibility/CorporateSocialResponsibility_CDD/Documents/SR2019E.pdf
 - CLP Power Hong Kong

- 2019 annual report, page 97 – https://www.clpgroup.com/en/Investors-Information-site/Documents/Financial%20Report%20PDF/e_2019Annual%20Report.pdf

- **New Zealand Government Ministry for the Environment**
 - <https://www.mfe.govt.nz/node/18670/>
 - 2016 factors (published Dec 2016) – https://www.mfe.govt.nz/sites/default/files/media/2016-voluntary-ghg-reporting-summary-tables-emissions_0.pdf
 - 2018 factors (published May 2019) – <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/2019-emission-factors-summary.pdf>

- **United Nations Framework Convention on Climate Change**
 - <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>
 - **Canada** – download ‘NIR’ (national inventory report) (Published: 15 Apr 2019). Page 60 onwards on ‘Part 3’ document.

- **United States EPA eGrid Database**
 - 2018 factors (Published: Jan 2020. Revised: Mar 2020)
 - <https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid>
 - EFs converted from lbs/MWh to kg/kWh and calculated T&D factors