



CARBON FOOTPRINT

COUNTRY SPECIFIC ELECTRICITY GRID GREENHOUSE GAS EMISSION FACTORS

Last Updated June 2019

COUNTRY SPECIFIC ELECTRICITY FACTORS – June 2019

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	Factor (kgCO ₂ e per kWh)	Source	Year	Comments
Africa	South Africa	0.9606	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
Asia	China (PR)	0.6236	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Hong Kong (China)	0.8000 or 0.7400	Hong Kong Electric Company (2018) or CLP Group (2018) These two companies supply different areas of HK so check which one you need.	2018	Combined generation and T&D factor
	India	0.7429	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Indonesia	0.7551	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Japan	0.4916	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Korea (Republic)	0.5170	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
Australasia	Australia	Gen = 0.8000 T&D = 0.1000	Australian Government	2018	Published in July 2018
	New Zealand	Gen = 0.0074 T&D = 0.0977	Ministry for the Environment https://www.mfe.govt.nz/node/18670/	2018 (based on 2016 data)	Emission factors published in 2019, based on 2018 national inventory which is based on 2016 data.
Middle East	Saudi Arabia	0.7176	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Turkey	0.5434	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	United Arab Emirates	0.4333	Dubai Electricity & Water Authority (sustainability report 2017)	2017	Generation factor only

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North & Central America	Canada	Gen = 0.1300 T&D = 0.0100	UN Framework Convention on Climate Change	2019 (based on 2017 data)	Regional factors are available. See separate table below.
	Mexico	0.4640	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	United States	0.4759	US Env Protection Agency (EPA) eGrid	2016	Combined generation and distribution factor. Regional factors are available. See separate table below.
South America	Argentina	0.3583	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Brazil	0.0927	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
Europe	Austria	0.1420	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Belgium	0.1670	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Bulgaria	0.4700	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Croatia	0.4170	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Cyprus	0.6390	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Czech Republic	0.5760	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Denmark	0.2090	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Estonia	0.8750	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Finland	0.1430	Association of Issuing Bodies (AIB)	2018	Production mix factor
	France	0.0470	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Germany	0.4690	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Greece	0.5670	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Hungary	0.3140	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Iceland	0.0000	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Ireland	0.3930	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Italy	0.3270	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Latvia	0.3130	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Lithuania	0.3620	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Luxembourg	0.2010	Association of Issuing Bodies (AIB)	2018	Production mix factor
Malta	0.7610	Association of Issuing Bodies (AIB)	2018	Production mix factor	
Netherlands	0.4570	Association of Issuing Bodies (AIB)	2018	Production mix factor	

Grouping	Country	Factor (kgCO ₂ e per kWh)	Source	Year	Comments
	Norway	0.0110	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Poland	0.8460	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Portugal	0.3070	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Romania	0.4010	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Russian Federation	0.3302	Climate Transparency (2018 Report)	2017	Emissions intensity of the power sector
	Slovakia	0.1690	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Slovenia	0.3350	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Spain	0.2880	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Sweden	0.0120	Association of Issuing Bodies (AIB)	2018	Production mix factor
	Switzerland	0.0140	Association of Issuing Bodies (AIB)	2018	Production mix factor
	United Kingdom	0.2773	UK Govt – Defra/BEIS	2019 (based on 2017 data)	Combined Generation + Transmission & Distribution factor

UNITED STATES REGIONAL FACTORS (BY STATE)

Regional factors are sourced directly from the United States Environmental Protection Agency's (EPA) eGrid database. 2016 factors were published in February 2018. **Next set due to be published in 2020.**

State	Grid	Generation Factor (kgCO ₂ e per kWh)	T&D Factor (kgCO ₂ e per kWh)	Year
UNITED STATES		0.45548	0.0213	2016 (published 2018)
Alaska (AK)	ASCC & ASCC Misc. - Alaska Grid	0.4218	0.0234	2016
Alabama (AL)	SERC - South	0.4162	0.0196	2016
Arkansas (AR)	SERC - South	0.5092	0.0239	2016
Arizona (AZ)	WECC - Southwest	0.4250	0.0188	2016
California (CA)	WECC - California	0.2060	0.0091	2016
Colorado (CO)	WECC - Rockies	0.6704	0.0296	2016
Connecticut (CT)	NPCC - New England	0.2278	0.0107	2016
Washington DC (DC)	RFC - East	0.2191	0.0103	2016
Delaware (DE)	RFC - East	0.4034	0.0190	2016

State	Grid	Generation Factor (kgCO _{2e} per kWh)	T&D Factor (kgCO _{2e} per kWh)	Year
UNITED STATES		0.45548	0.0213	2016 (published 2018)
Florida (FL)	FRCC - All	0.4667	0.0219	2016
Georgia (GA)	SERC - South	0.4570	0.0215	2016
Hawaii (HI)	HICC - Misc. & Oahu	0.6953	0.0393	2016
Iowa (IA)	MRO - East	0.4553	0.0214	2016
Idaho (ID)	WECC - Rockies	0.0859	0.0038	2016
Illinois (IL)	MRO- East	0.3701	0.0174	2016
Indiana (IN)	RFC - West	0.8278	0.0389	2016
Kansas (KS)	SPP- North	0.5462	0.0257	2016
Kentucky (KY)	SERC - Tennessee Valley	0.8927	0.0419	2016
Louisiana (LA)	SERC - South	0.4001	0.0188	2016
Massachusetts (MA)	NPCC - New England	0.3754	0.0176	2016
Maryland (MD)	RFC - East	0.4624	0.0217	2016
Maine (ME)	NPCC - New England	0.1577	0.0074	2016
Michigan (MI)	RFC - Michigan	0.5017	0.0236	2016
Minnesota (MN)	MRO - East	0.4628	0.0217	2016
Missouri (MO)	SERC - South	0.7706	0.0362	2016
Mississippi (MS)	SERC - South	0.4278	0.0201	2016
Montana (MT)	WECC - Rockies	0.5716	0.0253	2016
North Carolina (NC)	SERC - Virginia/Carolinas	0.3958	0.0186	2016
North Dakota (ND)	MRO-West	0.7597	0.0357	2016
Nebraska (NE)	MRO-West	0.5855	0.0275	2016
New Hampshire (NH)	NPCC - New England	0.1437	0.0068	2016
New Jersey (NJ)	RFC - East	0.2539	0.0119	2016
New Mexico (NM)	WECC - Southwest	0.7179	0.0317	2016
Nevada (NV)	WECC - Rockies	0.3500	0.0155	2016
New York (NY)	NPCC - LI, NYC, & Upstate NY	0.2113	0.0099	2016
Ohio (OH)	RFC - West	0.6692	0.0314	2016
Oklahoma (OK)	SPP- South	0.4755	0.0223	2016
Oregon (OR)	WECC - Northwest	0.1393	0.0062	2016
Pennsylvania (PA)	RFC - West	0.3901	0.0183	2016
Rhode Island (RI)	NPCC - New England	0.3954	0.0186	2016
South Carolina (SC)	SERC - Virginia/Carolinas	0.2870	0.0135	2016

State	Grid	Generation Factor (kgCO ₂ e per kWh)	T&D Factor (kgCO ₂ e per kWh)	Year
UNITED STATES		0.45548	0.0213	2016 (published 2018)
South Dakota (SD)	MRO-West	0.2343	0.0110	2016
Tennessee (TN)	SERC - Tennessee Valley	0.4529	0.0213	2016
Texas (TX)	ERCOT - All	0.4784	0.0246	2016
Utah (UT)	WECC - Rockies	0.7432	0.0329	2016
Virginia (VA)	SERC - Virginia/Carolinas	0.3715	0.0175	2016
Vermont (VT)	NPCC - New England	0.0303	0.0014	2016
Washington (WA)	WECC - Northwest	0.0852	0.0038	2016
Wisconsin (WI)	MRO - East	0.6334	0.0298	2016
West Virginia (WV)	SERC - Virginia/Carolinas	0.9029	0.0424	2016
Wyoming (WY)	WECC - Rockies	0.9258	0.0409	2016

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 _{2e} per kWh)	T&D Factor (kgCO _{2e} per kWh)	Year
Canada	0.13	0.01	<i>2017 (published 2019)</i>
Alberta (AB)	0.75	0.05	2017 (published 2019)
British Columbia (BC)	0.0093	0.0004	2017 (published 2019)
Manitoba (MT)	0.0019	0.0002	2017 (published 2019)
New Brunswick (NB)	0.31	0.02	2017 (published 2019)
Newfoundland and Labrador (NL)	0.04	Negligible	2017 (published 2019)
Nova Scotia (NS)	0.67	0.05	2017 (published 2019)
Northwest Territories (NT)	0.18	Negligible	2017 (published 2019)
Nunavut (NU)	0.75	0.04	2017 (published 2019)
Ontario (ON)	0.017	0.003	2017 (published 2019)
Prince Edward Island (PE)	0.014	Unknow use 'New Brunswick'	2017 (published 2019)
Quebec (QC)	0.0013	0.0002	2017 (published 2019)
Saskatchewan (SK)	0.66	0.05	2017 (published 2019)
Yukon Territory (YT)	0.05	0.007	2017 (published 2019)

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 in the June 2019 using the report published in July 2018 report.

State	Generation Factor (kgCO _{2e} per kWh)	T&D Factor (kgCO _{2e} per kWh)	Year
AUSTRALIA	0.80	0.10	<i>2016/17 (published in 2018)</i>
Australian Capital Territory	0.82	0.10	2016/17 (published in 2018)
New South Wales	0.82	0.10	2016/17 (published in 2018)
Northern Territory	0.64	0.09	2016/17 (published in 2018)
Queensland	0.80	0.13	2016/17 (published in 2018)
South Australia	0.51	0.10	2016/17 (published in 2018)
Tasmania	0.19	0.03	2016/17 (published in 2018)
Victoria	1.07	0.10	2016/17 (published in 2018)
Western Australia	0.70	0.05	2016/17 (published in 2018)

Sources of Emissions Factors:

- **AIB (2019). 2018 Residual Mix Factors.** <https://www.aib-net.org/facts/european-residual-mix>
- **Australian Government Dept of Environment & Energy Emissions Factors**
 - Page 19 & 68 for regional factors (July 2018 report) – <http://www.environment.gov.au/system/files/resources/80f603e7-175b-4f97-8a9b-2d207f46594a/files/national-greenhouse-accounts-factors-july-2018.pdf>
- **Climate Transparency (2017)** – Country profiles from ‘G20 Brown to Green Report 2017’ - <https://www.climate-transparency.org/wp-content/uploads/2019/01/2018-BROWN-TO-GREEN-REPORT-FINAL.pdf>
- **Defra/BEIS 2019 Emissions Factors** - <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>
- **Dubai Electricity & Water Authority (DEWA) (2017)** - <https://www.dewa.gov.ae/en/customer/sustainability/conserve-now/sustainability-reports>
- **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>)
 - 2018 sustainability report, page 67 – “CO2e per electricity sold (kg/kWh)”
https://www.hkelectric.com/en/CorporateSocialResponsibility/CorporateSocialResponsibility_CDD/Documents/SR2018E.pdf
 - CLP Power Hong Kong
 - 2018 annual report, page 94 & 288 – https://www.clpgroup.com/en/Investors-Information-site/Documents/Financial%20Report%20PDF/e_2018%20Annual%20Report.pdf
- **New Zealand Government Ministry for the Environment**

- <https://www.mfe.govt.nz/node/18670/>
- 2016 factors – https://www.mfe.govt.nz/sites/default/files/media/2016-voluntary-ghg-reporting-summary-tables-emissions_0.pdf
- 2018 factors – <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). Page 59 onwards on 'Part 3' document.

- **United States EPA eGrid Database**
 - 2016 factors (published Feb 2018)
 - <https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid>
 - EFs converted from lbs/MWh to kg/kWh and calculated T&D factors