

# Measurabl GHG Calculation Methodology

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## Background

Measurabl displays greenhouse gas (GHG) emission metrics for sites in the “Portfolio/Subgroup Trends” tab, Portfolio/Subgroup Overview tab, in the app’s GRESB and CDP modules, and within exports available on the Reporting tab, including the Data Quality Report, the Portfolio Sustainability Report, and the CDP Scope 1 and Scope 2 reports. Measurabl reports GHG emissions in metric tons of CO<sub>2</sub> equivalent (MT CO<sub>2</sub>e). Measurabl uses the 100-year Global Warming Potential (GWP) values from the IPCC (Intergovernmental Panel on Climate Change) Fifth Assessment Report to calculate CO<sub>2</sub>e (see Appendix 2). Measurabl uses industry standard emissions factors across fuels and global regions.



Outside of CDP and the Data Quality Report, Measurabl follows the Operational Control method of the GHG Protocol. This means that the application assigns emissions to scopes based on who controls the area where the meter is tracking usage. In other words, emissions from meters tracking usage on tenant spaces are always considered scope 3, even if the landlord is paying the bills for the meter. The rationale is that the tenant is really the one in control of the emissions since they're using the energy day to day. The fact that the landlord pays the bills is incidental and so doesn't make the landlord directly responsible for those emissions.

<b>Area in Measurabl</b>	<b>Tenant Space Paid by Tenant</b>	<b>Tenant Space Paid by Landlord</b>
<b>GRESB and Portfolio/Subgroup Trends</b>	Scope 3	Scope 3
<b>CDP and Data Quality Report</b>	Scope 3	Scope 1/2

The "Portfolio/Subgroup Trends" page follows logic from GRESB and CDP by zeroing out emissions from sites for time periods after their "Sold Date" and before their "Bought Date". So if you have a site that was sold on 12/31/2017 or bought on 1/1/2019, its carbon emissions (and usage) for 2018 will appear as 0, even if the site has complete utility data entered for that year. The app does calculate emissions for sites undergoing new construction or major renovation.

## Scope 1 Emissions

Measurabl calculates scope 1 emissions based on actual energy data entered under the "Fuel" category, which includes Natural Gas, Diesel, Fuel Oils #2, #5, and #6, Propane, Compressed Natural Gas, Biodiesel (B100 and B20), and Renewable Diesel.

Measurabl first calculates the total usage of each fuel. The thermal units for each fuel (as entered by the user when each meter was created) are converted into a common unit: megawatt hours (MWh). To do this, the app uses the thermal conversion factors in [Appendix 1](#).

Measurabl then multiplies the usage (in MWh) of each fuel by its emissions factor (listed in [Appendix 3](#)). The emissions for all scope 1 fuel types consumed at the site during the evaluation period are summed, and the result is displayed in the app as "Scope 1 Emissions." Reminder:



within GRESB and CDP this total does not include emissions from fuel meters marked as tenant paid.

Example scope 1 emissions calculation:

Fuel Type	Usage (kBTU)	Conversion Factor (kBTU to MWh)	Usage (MWh)	Emissions factor (MT CO2e per MWh)	Emissions (MT CO2e)
Natural Gas	296,448	0.000293083235638921	86.883939038686853	0.18121132	15.74

## Scope 2 Emissions

Measurabl calculates scope 2 emissions as a sum of emissions from energy usage entered under the “Electric” and “District” categories.

### Electric

Grid electric meters are assigned an emissions factor based on the country designated for their site. Countries outside the U.S. and Canada have country-wide emissions factors for electricity. The U.S. has different emissions factors for each eGRID subregion (learn more about eGRID subregions [here](#)). Sites in the U.S. are mapped to eGRID subregions by their zip code, and you can learn more about the mapping [here](#). Sites that cannot be mapped to an eGRID subregion have their emissions calculated using a state-specific emissions factor, also sourced from eGRID.

Canada has different emissions factors for each province. All of the current emissions factors are listed in [Appendix 3](#).

Measurabl sums offsite generated electric usage across meters for the evaluation period. Depending on the emissions factor used, the summed electricity may be converted to MWh.

Measurabl then multiplies the total offsite generated electric usage by the regional emission factor.



## Example electric emissions calculation

Electric Usage (kWh)	eGRID subregion	Emissions Factor (MT CO <sub>2</sub> e per kWh)	Emissions (MT CO <sub>2</sub> e)
1,038,764.51	RFC West	.00056783	589.84

## District

Measurabl uses the same process to calculate scope 2 emissions from energy usage entered under the “District” category as is used to calculate scope 1 emissions from “Fuel” energy usage. “District” energy includes steam, hot water, and chilled water (from various generation methods).

Measurabl totals usage for each district emissions source during the evaluation period, then converts each total to a common unit of MWh. Measurabl then multiplies each usage by its emissions factor, then sums the emissions, in MT CO<sub>2</sub>e.

## Example district emissions calculation

Fuel Type	Usage (kBtu)	Conversion Factor (kBtu to MWh)	Usage (MWh)	Emissions Factor (MT CO <sub>2</sub> e per MWh)	Emissions (MT CO <sub>2</sub> e)
Steam	9,179,481	0.0002930832356389210	2,690.35	.2265	609.36

## Scope 2 Emissions CDP Calculations

Per CDP guidelines, there are some additional steps Measurabl uses to calculate scope 2 emissions within the “Carbon Emissions” tab of the app’s CDP report.

## Location-based and Market-based methods



CDP requires organizations to report scope 2 carbon emissions from electricity using two different methods.

**The Location-based method** assigns the same, regional grid emission factors for all purchased electricity. The intent is to have a simple accounting method available where all offsite purchased electricity is multiplied by one emission factor, since many organizations do not have supplier-specific emissions data. Measurabl uses this method to calculate Scope 2 emissions across the Portfolio Trends, Data Quality Report, and GRESB Data Summary / Asset Level Export.

Let's say you have one site, in California, that used 1,000 MWh of grid electricity and 1,000 MWh of offsite renewable electricity. Under the location-based method, all 2,000 kWh are multiplied by the regional grid emissions factor.

Usage Type	Usage (MWh)	Emission Factor (WECC California)	Emissions
Offsite nonrenewable (grid)	1,000	0.206498382	226.2
Offsite renewable	1,000	0.206498382	226.2
Onsite renewable	1,000	0	0
<b>Total</b>	<b>3,000</b>		<b>452.4</b>

**The Market-based method** assigns different emissions factors depending on the source of the electricity. Renewable electricity, including Off-site Renewable, is assigned zero emissions. Measurabl uses this method to calculate CDP Scope 2 Market Based Emissions.

	Usage (MWh)	Emission Factor	Emissions
Offsite nonrenewable (grid)	1,000	0.206498382 (WECC California)	226.2
Offsite renewable	1,000	0	0
Onsite renewable	1,000	0	0
<b>Total</b>	<b>3,000</b>		<b>226.2</b>

To revisit the site above, the 1,000 MWh of offsite renewable electricity will contribute 0 carbon emissions. The site's market-based emissions will be substantially lower than its location-based



emissions because the market-based method assumes no emissions from the 1,000 MWh of Off-site Renewable electricity.

## CDP Scope 2 Estimations

**Method 1:** If a site has actual usage data for the reporting period but some months (fewer than six) are missing data, the estimate for the missing months is the average of the actual months. If January has no data, average monthly usage from February-December is used as an estimate.

**Method 2 (if method 1 cannot be used):** If a month with no actual data has prior year usage, that prior year usage becomes the estimate. If January 2018 has no actual data, January 2017 actual usage (if entered) is the estimate.

If a site is missing more than six months of electricity data during the reporting period, the app estimates energy use by multiplying the common floor area by an average energy intensity figure. That intensity figure comes from the [CBECS 2012 survey](#) for the specific property type. For example: offices have a different energy intensity figure used for estimates than hotels. Estimates are only applied for periods where the site was owned/leased. If a site has no 2018 data, but was sold on 6-30-2018, only six months of estimated usage/emissions will be applied.

**-Leased sites and owned sites with no common area** that have fewer than six months of electricity data have estimates applied for the whole site's floor area.

**-Owned sites with common area** and fewer than six months of electricity data have estimates applied only for the site's common area.

-Measurabl uses the property type with the majority of the site's floor area when applying these energy use estimates. The app does not prorate estimated energy use based on the percent of total floor area of each property type in a mixed use site.

For example: if a site contains 90 percent office space with 10 percent data center space, the app will only use the CBECS 2012 figure for office when estimating common area energy use. If you need emissions estimates for each property type within a mixed use site, you'll need to split each property type out as its own separate site within Measurabl. The app then calculates emissions by multiplying the estimated energy use (however it was derived) by the appropriate emissions factors.



## Appendix 1: Energy and Water Conversion Factors

Measurabl Meter Type	Input Unit Options	Multiplier to get to kBtu	Multiplier to get to MWh	Source
District Steam	kg	2.632	0.000771395076201641	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
District Stream	kLbs	1,194	0.349941383352872	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
District Stream	kBtu	1	0.000293083235638921	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	MWh	3,412	1.0	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	kWh	3.412	0.001	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	MBtu/MMBtu	1,000	0.293083235638922	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	MLbs (Million Pounds)	1,194,000	349.941383352872	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	Lbs	1.194	0.000349941383352872	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	therms	100	0.0293083235638921	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
District Chilled Water	Ton Hours	12	0.00351699882766706	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All District	GJ	947.817	0.277789273153576	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Electricity	GJ	947.817	0.277789273153576	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Electricity	kBtu	1	0.000293083235638921	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Electricity	kWh	3.412	0.001	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Electricity	MBtu/MMBtu	1,000	0.293083235638922	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>



Electricity	MWh	3,412	1.0	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Natural Gas	CCF (Hundred cubic feet)	102.6	0.0300703399765533	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Natural Gas	CF (Cubic feet)	1,026	0.000300703399765533	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Natural Gas	KcF (Thousand cubic feet)	1,026	0.3007033997655330	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Natural Gas	McF (Million cubic feet)	1,026,000	300.7033997655330	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Natural Gas	Cubic meters	36.303	0.0106398007033998	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All Fuel	GJ	947.817	0.277789273153576	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All Fuel	MWh	3412	1.0	
All Fuel	kWh	3,412	0.001	
All Fuel	kBtu	1	0.000293083235638921	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All Fuel	MBtu/MMBtu	1,000	0.2930832356389220	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
All Fuel	Therms	100	0.0293083235638921	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	CCF (HUNDRED CUBIC FEET)	251.6	0.0737397420867526	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	CF (CUBIC FEET)	2,516	0.000737397420867526	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	KCF (THOUSAND CUBIC FEET)	2,516	0.7373974208675260	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	MCF (MILLION CUBIC FEET)	2,516,000	737.3974208675260	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>



Propane	CM (CUBIC METERS)	89	0.0260409410251326	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	Gallons (US)	92	0.0269636576787808	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	Gallons (UK)	110.484	0.0323810082063306	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Propane	liters	24.304	0.00712309495896835	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Diesel	Gallons (US)	138	0.0404454865181712	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Diesel	Gallons (UK)	165.726	0.0485715123094959	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Diesel	liters	36.456	0.0106846424384525	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Kerosene	Gallons (US)	135	0.0395662368112544	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Kerosene	Gallons (UK)	162.123	0.0475155334114889	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Kerosene	liters	35.663	0.0104522274325909	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 1	Gallons (US)	139	0.0407385697538101	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 1	Gallons (UK)	166.927	0.0489235052754982	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 1	liters	36.72	0.0107620164126612	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 2	Gallons (US)	138	0.0404454865181712	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 2	Gallons (UK)	165.726	0.0485715123094959	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 2	liters	36.456	0.0106846424384525	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 4	Gallons (US)	146	0.0427901524032825	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 4	Gallons (UK)	175.333	0.051387162954279	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>



Fuel Oil No. 4	liters	38.569	0.0113039273153576	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 5 & No. 6	Gallons (US)	150	0.0439624853458382	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 5 & No. 6	Gallons (UK)	180.137	0.0527951348182884	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Fuel Oil No. 5 & No. 6	liters	39.626	0.0116137162954279	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Compressed Natural Gas (CNG)	CCF (HUNDRED CUBIC FEET)	102.60	0.0300703399765533	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Compressed Natural Gas (CNG)	CF (CUBIC FEET)	1.0260	0.000300703399765533	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Compressed Natural Gas (CNG)	KCF (THOUSAND CUBIC FEET)	1,026.00	0.3007033997655330	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Compressed Natural Gas (CNG)	MCF (MILLION CUBIC FEET)	1,026,000	300.7033997655330	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Compressed Natural Gas (CNG)	CM (CUBIC METERS)	36.23	0.01063980070339980	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Renewable Diesel	Gallons (US)	138	0.0404454865181712	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Renewable Diesel	Gallons (UK)	165.726	0.0485715123094959	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Renewable Diesel	liters	36.456	0.0106846424384525	<a href="#">U.S. EPA ENERGY STAR Portfolio Manager</a>
Biodiesel (B100)	GALLONS (US)	126.2	0.0369871043376319	US Department of Energy <a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Biodiesel (B100)	GALLONS (UK)	151.5662	0.0444215123094959	US Department of Energy <a href="https://tedb.ornl.gov/wp-content/">https://tedb.ornl.gov/wp-content/</a>

				<a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Biodiesel (B100)	Liters	33.33851111	0.00977095870611492	US Department of Energy <a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Biodiesel (B20)	GALLONS (US)	135.93	0.0398388042203986	U.S. EPA ENERGY STAR Portfolio Manager <a href="https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf">https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf</a>
Biodiesel (B20)	GALLONS (UK)	163.24011	0.0478429396248535	U.S. EPA ENERGY STAR Portfolio Manager <a href="https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf">https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf</a>
Biodiesel (B20)	Liters	35.90916	0.0105243728018757	U.S. EPA ENERGY STAR Portfolio Manager US Department of Energy <a href="https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf">https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf</a>
Liquefied Petroleum Gas (LPG)	GALLONS (US)	91.3	0.0267584994138335	<a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Liquefied Petroleum Gas (LPG)	GALLONS (UK)	109.6513	0.0321369577960141	<a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Liquefied Petroleum Gas (LPG)	Liters	24.118907	0.00706884730482006	<a href="https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387">https://tedb.ornl.gov/wp-content/uploads/2020/02/TEDB_Ed_38.pdf#page=387</a>
Liquefied Natural Gas (LNG)	GALLONS (US)	80.51725769	0.023598258408	UK Department of Business, Energy, and Industrial Strategy <a href="https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020">https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020</a>
Liquefied Natural Gas (LNG)	GALLONS (UK)	96.70122648	0.028341508348008	UK Department of Business, Energy, and Industrial Strategy <a href="https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020">https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020</a>



				<a href="#">porting-conversion-factors-2020</a>
Liquefied Natural Gas (LNG)	Liters	21.270408	0.006234	UK Department of Business, Energy, and Industrial Strategy <a href="https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020">https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020</a>

Meter Type in Measurabl	Units	Multiplier to get Cubic Meters (m <sup>3</sup> )	Source
Water	CCF (HUNDRED CUBIC FEET)	2.831685	U.S. EPA ENERGY STAR Portfolio Manager
Water	CF (CUBIC FEET)	0.02831685	U.S. EPA ENERGY STAR Portfolio Manager
Water	CM	1	U.S. EPA ENERGY STAR Portfolio Manager
Water	CM (CUBIC METERS)	1	U.S. EPA ENERGY STAR Portfolio Manager
Water	CUBIC METERS	1	U.S. EPA ENERGY STAR Portfolio Manager
Water	GALLONS (UK)	0.004546092	U.S. EPA ENERGY STAR Portfolio Manager
Water	GALLONS (US)	0.003785412	U.S. EPA ENERGY STAR Portfolio Manager
Water	GALLONS	0.003785412	U.S. EPA ENERGY STAR Portfolio Manager
Water	KCF (THOUSAND CUBIC FEET)	28.31685	U.S. EPA ENERGY STAR Portfolio Manager
Water	KCM	1000	U.S. EPA ENERGY STAR Portfolio Manager
Water	KCM (THOUSAND CUBIC METERS)	1000	U.S. EPA ENERGY STAR Portfolio Manager
Water	KGAL (THOUSAND GALLONS) (UK)	4.546092	U.S. EPA ENERGY STAR Portfolio Manager
Water	KGAL (THOUSAND GALLONS) (US)	3.785412	U.S. EPA ENERGY STAR Portfolio Manager
Water	KGAL (THOUSAND GALLONS)	3.785412	U.S. EPA ENERGY STAR Portfolio Manager



Water	CGAL (HUNDRED GALLONS) (US)	0.3785412	U.S. EPA ENERGY STAR Portfolio Manager
Water	CGAL (HUNDRED GALLONS)	0.3785412	U.S. EPA ENERGY STAR Portfolio Manager
Water	CGAL (HUNDRED GALLONS) (UK)	0.4546092	U.S. EPA ENERGY STAR Portfolio Manager
Water	LITERS	0.001	U.S. EPA ENERGY STAR Portfolio Manager
Water	KILOLITERS	1	U.S. EPA ENERGY STAR Portfolio Manager
Water	MCF(MILLION CUBIC FEET)	28316.85	U.S. EPA ENERGY STAR Portfolio Manager
Water	MCF (MILLION CUBIC FEET)	28316.85	U.S. EPA ENERGY STAR Portfolio Manager
Water	MGAL (MILLION GALLONS) (UK)	4546.092	U.S. EPA ENERGY STAR Portfolio Manager
Water	MGAL (MILLION GALLONS) (US)	3785.412	U.S. EPA ENERGY STAR Portfolio Manager
Water	MGAL (MILLION GALLONS)	3785.412	U.S. EPA ENERGY STAR Portfolio Manager
Water	MILLION GALLONS PER DAY	3785.412	U.S. EPA ENERGY STAR Portfolio Manager

## Appendix 2: Global Warming Potential Values

Greenhouse Gas	GWP (CO <sub>2</sub> e)	Source
Carbon Dioxide (CO <sub>2</sub> )	1	<a href="#">IPCC Fifth Assessment Report (AR5)</a>
Methane (CH <sub>4</sub> )	28	<a href="#">IPCC Fifth Assessment Report (AR5)</a>
Nitrous Oxide (N <sub>2</sub> O)	265	<a href="#">IPCC Fifth Assessment Report (AR5)</a>



## Appendix 3: Measurabl Emissions Factors

The emission factors Measurabl uses to calculate carbon emissions are available [here](#), broken out into separate tabs by utility type and by country (for countries where Measurabl uses and can disclose specific emission factors). Each factor includes:

- The industry source that produced the factor
- The factor in its original unit
- The factor converted to Measurabl's common emission factor unit of MTCO<sub>2</sub>e per MWh
  - A dedicated tab shows the energy unit conversion factors used

Measurabl uses unique annual emission factors published by each industry source going back to 2011. Annual emission factors account for changes to electric grid and fuel carbon intensity that affect the carbon emissions generated by energy usage.

Measurabl uses the year provided by the industry source to assign each set of factors to specific calendar years. For example, eGRID released emission factors for US electricity in 2021 that were labeled 2019. In 2021, Measurabl applied those factors to calendar year 2019 through 2021, since they were the most recently released factors for US electricity. Measurabl updates factors upon their release by the relevant industry source (in this example eGRID) and enters the updated emission factors for the appropriate years in the [emission factor spreadsheet](#).

Measurabl also updates prior year factors if industry sources make changes in a later year. For example, in 2021 Canada released a set of factors that updated the 2018 emission factor for British Columbia that was originally released in 2019. Measurabl updated the 2018 British Columbia factor to use the updated value released in 2021.

The emission factors Measurabl cannot disclose are the electricity factors for countries outside of the US, Canada, and United Kingdom:

Electricity emission factors for the following countries are sourced from the International Energy Agency (IEA) 2023 proprietary dataset subject to [IEA Terms and Conditions](#). For more information, see [IEA's website](#).

Albania  
Algeria  
Angola

Argentina  
Armenia  
Australia  
Austria  
Azerbaijan  
Bahrain  
Bangladesh  
Belarus  
Belgium  
Bosnia and Herzegovina  
Brazil  
Bulgaria  
Cameroon  
Canada  
Chile  
China  
Colombia  
Costa Rica  
Cote d'Ivoire  
Croatia  
Cyprus  
Czech Republic  
Denmark  
Dominican Republic  
Ecuador  
Egypt  
El Salvador  
Estonia  
Finland  
France  
Georgia  
Germany  
Greece  
Guatemala  
Honduras  
Hong Kong  
Hungary  
Iceland  
India  
Indonesia  
Iraq  
Ireland  
Israel

Italy  
Jamaica  
Japan  
Jordan  
Kazakhstan  
Kenya  
Kuwait  
Latvia  
Lebanon  
Libya  
Lithuania  
Luxembourg  
Malaysia  
Malta  
Mexico  
Morocco  
Namibia  
Netherlands  
New Zealand  
Nigeria  
Norway  
Oman  
Pakistan  
Panama  
Paraguay  
Peru  
Philippines  
Poland  
Portugal  
Qatar  
Romania  
Russia  
Saudi Arabia  
Senegal  
Serbia  
Singapore  
Slovakia  
Slovenia  
South Africa  
Spain  
Sri Lanka  
Sweden  
Switzerland



<p style="text-align: center;">           Syrian Arab Republic            Thailand            Trinidad and Tobago            Tunisia            Turkey            Ukraine            United Arab Emirates            United Kingdom            Uruguay            Vietnam         </p>
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### Vehicle Emission Factors (CDP)

Fuel	Used in Countries	Emission Factor	Unit	Source
Vehicle fuel (gas)	All	0.008871238	metric tonnes CO2e per gallon	World Resources Institute (2008). GHG Protocol tool for mobile combustion. Version 2.2
Vehicle fuel (diesel)	All	0.010156986	metric tonnes CO2e per gallon	World Resources Institute (2008). GHG Protocol tool for mobile combustion. Version 2.2