ANNEX 1: 2020 SUN LIFE GHG REPORTING METHODOLOGY

Contents

1.0 Background

Energy Profiles Limited (EPL) tracks utility consumption and greenhouse gas (GHG) emissions for Sun Life Financial's (SLF's) global portfolio, including investment properties, corporate real estate (CRE) and corporate travel.

Each year, EPL prepares an energy and emissions summary report, summarizing progress made in reducing energy / emissions across the overall property portfolio.

There are two goals for this exercise, in line with SLF's internal and public sustainability reporting:

1. To understand the 3-year energy and GHG emissions trend for SLF's global portfolio, following the guidance of the GHG Protocol[1].
2. To determine the portfolio's year-over-year normalized[2] GHG emissions performance, removing the impact of outside influences such as changes to weather and occupancy. This is the metric used to calculate SLF's performance against their global GHG emissions target.

This document details the methodology used to derive the GHG emissions reported for the SLF portfolio for the 2020 emission reporting year.

[1] The GHG Protocol – A Corporate Accounting and Reporting Standard (World Resources Institute, 2004)

[2] Normalized for weather, occupancy, and exceptional tenant loads, where applicable

2.0 Organizational Boundaries

Organizational boundaries define the approach to determining ownership or control over the energy and emissions reported for the property portfolio.

2.1 Investment Properties

SLF reports energy and emissions using the financial control approach, prorating for their equity share in each property, consistent with recommendations from REALPAC[3].

SLF's financial control is determined for each property and utility account, as defined by the GHG Protocol:

> *The company has financial control over the operation if the former has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from its activities.*

In other words, emissions are reported for properties and operations where SLF or their agents, i.e. the property managers, are responsible for managing utility consumption.

Next, emissions are prorated for SLF's equity share in each property, defined as follows by the GHG Protocol:

> *Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation. The equity share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation. Typically, the share of economic risks and rewards in an operation is aligned with the company's percentage ownership of that operation, and equity share will normally be the same as the ownership percentage.*

In other words, in cases where SLF has partial ownership of a property, emissions are reported only for the portion of the property/operation owned by SLF.

2.1.1 Determining Responsibility for Emissions

The responsibility for emissions from utility consumption is the party responsible for paying the utility costs.

In general, utility accounts billed to SLF or their agents are defined to be within SLF's financial control, since SLF has the potential to gain economic benefits through the building operations. Utility accounts paid directly by tenant are outside of SLF's financial control.

One exception is 'pass-through' utility accounts. Typically, these accounts exist at industrial properties or buildings with triple-net leases where the owner / property manager pays the utility bills but has no influence over utility use or building systems. In these cases, SLF does not directly benefit from changes to the tenants' operations, so they are treated as if the tenant were billed directly by the utility company.

2.1.2 Submetered Consumption

Submetered energy use billed to tenants by SLF's agents is outside of the organizational boundary of SLF, as recommended by REALpac:

> *Where sub-metering of tenants occurs, the party that is directly responsible for the utility costs is a reasonable method for determining control. For instance, if an owner installed electrical sub-metering for each tenant, and the*

[3] Whose Carbon Is It? GHG Emissions and Commercial Real Estate (Real Property Association of Canada, 2010)

tenants were responsible for payment of the electricity consumed, then it is far less likely that the owner is responsible for any associated emissions…

2.2 Corporate Real Estate (CRE) Properties

Corporate Real Estate (CRE) properties / leased spaces are likewise reported using the financial control approach. Where SLF pays the utility bill directly or utility use is submetered by the landlord, emissions are considered to be within SLF's financial control.

At CRE properties where utility bills are paid by the landlord, emissions are considered to be outside of SLF's Financial Control and could be considered out of scope. However, to ensure transparency and completeness of SLF's GHG footprint, these emissions are included as Scope 3 emissions, prorated for SLF's share of the building's total gross leasable area (GLA) as per the Operational Boundaries discussed in Section 3.2.

For Corporate Real Estate leases where Sun Life is subleasing space to another tenant, the subtenant's emissions are outside of financial control and are not included.

2.2.1 CRE Spaces in Investment Properties

In some cases, SLF has CRE leased spaces in SLF Investment properties, i.e. buildings that are both owned (fully or partially) and occupied (fully or partially) by SLF. In these cases emissions are included in both the Investment and CRE emissions data, albeit under different scopes, e.g. Scope 1 for Investment properties and Scope 3 for CRE properties.

Double-counting is avoided when Investment and CRE energy/emissions are rolled up to the full portfolio level, as follows:

Where emissions are Scope 1/2 from an investment perspective, but Scope 3 from a CRE/tenant perspective (or vice versa), they are reported as Scope 1/2.

2.3 Corporate Travel

Emissions resulting from SLF's corporate air, rail, rental car, and personal vehicle travel are reported using the distance-based[4] method, as per the GHG Protocol, whereby the distance traveled is multiplied by the appropriate emission factor for the mode of transportation to calculate emissions.

3.0 Operational Boundaries

Operational boundaries define the parts of the operation, or 'activities', for which emissions will be reported. Emissions are reported for energy and water consumed and waste generated across the portfolio, as well as for Corporate Travel. Scope 1, 2 and 3 emissions are reported, as follows:

3.1 Investment Properties

Scope 1 emissions are direct emissions that originate at properties. These include natural gas and fuel oil consumption for space heating, water heating and, in some cases, cooking.

[4] Technical Guidance for Calculating Scope 3 Emissions – Supplement to the Corporate Value Chain (Scope 3) Accounting and Reporting Standard (Word Resources Institute, 2013)

Scope 2 emissions are indirect emissions from purchased electricity, steam, and chilled water that is consumed at properties, but generated elsewhere. Emissions from submetered tenant consumption are outside of SLF's organizational boundary, as discussed in Section 2.1, and are therefore not included as Scope 2 emissions.

Scope 3 emissions are reported for water consumption, waste generation (where data is available), and submetered tenant energy consumption (where tenants are billed for actual usage) at properties. While submetered tenant consumption is outside of the organizational boundary, it is reported as Scope 3 (other indirect emissions) for completeness and to allow for comparison of overall emissions to historical years when submeter-based billing was not present.

3.2 Corporate Real Estate (CRE) Properties

Scope 1 emissions are reported for heating fuel consumption billed directly to SLF.

Scope 2 emissions are reported for purchased electricity, steam and chilled water that is consumed at properties, where SLF pays for utilities directly or where utility use is submetered by the landlord and billed to SLF.

Scope 3 emissions are reported for water consumption. Additionally, emissions from electricity, steam, chilled water, and natural gas consumption where the landlord is responsible for paying for utilities and does not submeter SLF's consumption are reported as Scope 3. Landlord-paid utilities are pro-rated for SLF's share of the building's total gross leasable area (GLA).

3.3 Corporate Travel

Scope 3 emissions from the transportation of employees for business related activities in vehicles owned or operated by third parties are reported (classified as Category 6: Business Travel, per the GHG Protocol).

3.4 Inventory Exclusions

Of the relevant emissions applicable to SLF, the following sources are not included in the 2020 reporting year:

Fugitive emissions from refrigerants: Information regarding chiller specifications and refrigerant types has not been compiled. Fugitive emissions from refrigerants are anticipated to be of low materiality.

Diesel fuel for back-up generation: Diesel fuel use for back-up generation is not available. Emissions resulting from back-up generation are anticipated to be of low materiality.

4.0 Application of Boundaries

The following table summarizes the application of the Operational and Organizational Boundaries detailed in Sections 2 and 3 above.

Reporting Boundaries by Portfolio Segment

Portfolio Segment	Bill paid by	Scope 1	Scope 2	Scope 3
Investment Properties (equity share)				
Heating fuel	Sun Life			
Common electricity/steam/chilled water	Sun Life			
Submetered electricity (non-Sun Life tenants)	Sun Life			
Water	Sun Life			
Waste	Sun Life			
Corporate Real Estate (occupied space)				
Heating fuel	Sun Life			
Electricity/steam/chilled water	Sun Life			
Submetered electricity (Sun Life is tenant)	Landlord			
Non-submetered utilities (all utility types)	Landlord			
Water	Sun Life			
Corporate Travel				
Air travel	Sun Life			
Rail travel	Sun Life			
Car travel (rental, personal)	Sun Life			

5.0 Comparison to Historical Years

5.1 Base Year Selection

For comparative purposes, SLF reports GHG emissions on a three-year-rolling basis. 2018 is the Base Year for the 2020 reporting year, and energy and emissions are trended from 2018-2020. This method has been selected to allow for a meaningful presentation of historical performance, while ensuring that comparisons are still relevant given the significant turnover in properties in the portfolio over time.

5.2 Base Year Recalculation Policy

Energy and emissions are recalculated for the Base Year and each historical year, in keeping with the GHG Protocol, to account for the following factors:

1. Property acquisitions and divestments and lease turnover by SLF.
2. Spaces owned / occupied in past years, but previously excluded from scope.
3. Travel occurring in past years, but previously excluded from scope.
4. Corrections to historical data based on availability of more accurate information.
5. Changes to the Reporting Methodology.

In cases where historical data is not available, historical consumption is estimated based on the best data available. The Base Year is not recalculated to account for new property developments or demolitions.

Adjustments for acquisitions / divestments are treated using the 'Same-year, Pro-rata'[5] approach, meaning that buildings only owned for a portion of the reporting year (2020) are included in all historical years for the same period. Utility use, waste, emissions, and 'effective' gross leasable area are all adjusted proportionately for the period of ownership in 2020.

6.0 Treatment of Waste

SLF reports emissions from waste generated at BentallGreenOak managed Investment office properties, and some other Investment properties. Emissions are reported for trash that is sent to landfill only. No emissions are reported for recycled or composted waste.

Emission reductions occur at some properties that send trash to Waste-to-Energy (WTE) facilities where it is used to generate electricity.

To conservatively estimate emissions from trash sent to WTE facilities, it is assumed that 10% of the material sent to WTE facilities still ends up in landfill.

Emissions are calculated using the following formulas for properties that send trash to WTE facilities:

Landfilled trash = trash weight produced by site – 0.9 * trash weight sent to WTE facility

Emissions = landfilled trash * waste emission factor

Emissions produced from power production at WTE facilities are not included in this report on the basis that the trash is used as a fuel source, as opposed to being wasted. Analogously, a natural gas producer would not report emissions from the combustion of fuel at generating stations to which it sells fuel. Emissions from the combustion of waste at WTE facilities would be accounted for in the electricity emission factor for the region in which the power is generated.

7.0 Renewable Energy Credits

Renewable Energy Credits (RECs) represent the rights to the environmental benefits from generating electricity from renewable sources. RECs are purchased for some Investment Properties and are reported using the Market-based Approach, as discussed below.

7.1 Market-based Approach vs. Location-based Approach

In January 2015, the World Resource Institute published the GHG Protocol Scope 2 Guidance[6], defining two approaches to emission reporting and specifying that emissions should be reported using both approaches (dual reporting), effective as of the 2015 reporting year.

- The location-based approach reflects the average emissions intensity of grids on which energy consumption occurs and does not account for REC purchases or any other contractual instruments.
- The market-based approach reflects the emissions from electricity that SLF has chosen to purchase via contractual instruments. This approach does account for REC purchases.

[5] Base year recalculation methodologies for structural changes - Appendix E to the GHG Protocol Corporate Accounting and Reporting Standard – Revised Edition (World Resources Institute, 2005)

[6] GHG Protocol Scope 2 Guidance – An amendment to the GHG Protocol Corporate Standard (World Resources Institute, 2015)

In light of this guidance, both location-based and market-based emissions are reported for SLF's portfolio, per the Base Year Recalculation Policy detailed in Section 5.2.

7.2 Quality Criteria

The GHG Protocol Scope 2 Guidance, discussed in Section 7.1, sets out 8 'Quality Criteria' for the inclusion of contractual instruments, such as RECs, in market-based accounting.

All RECs reported are Green-e certified or equivalent and specify 100% wind power. Green-e has stated publicly that their certified RECs meet the Quality Criteria requirements[7].

7.3 Volume Allocation

REC contracts typically specify the volume of RECs purchased in one of two ways:

1. As a percentage of a building's electricity consumption
2. As a fixed amount, approximating a percentage of the building's total electricity (or in some cases total energy) use over a specified number of years.

In cases where a fixed volume of RECs are purchased, there are often no start and end dates associated with the agreements; the contracts confirm only the amount of renewable energy that will be delivered to the grid and a number of years for which the contract applies. In these cases, it has been assumed that the contracted renewable energy volume was delivered to the grid linearly over the specified number of years, starting at the date the contract was executed.

In cases where RECs cover common area and tenant electricity use at a property, RECs are first applied to the common area consumption and the remainder are applied to tenant consumption.

7.4 Market-based emissions calculations

Market-based emissions are calculated as follows, in accordance to the GHG Protocol Scope 2 Guidance:

1. Electricity consumption at a property for which RECs are purchased is reported as having zero emissions, given that all RECs reported are from 100% wind generation sources.
2. For all other electricity consumed at a property, emissions are calculated using the appropriate "residual mix" emission factors, where available[8]. Residual mix emission factors represent the emissions from the grid, after discounting reductions achieved by RECs sold on the market. 2019 is the first year for which residual mix emission factors are available for the US.
3. In cases where RECs are purchased for more than 100% of a property's electricity consumption, emissions from electricity are reported as zero (i.e. negative emissions are not reported).

[7] Green-e Energy Summary of WRI Scope 2 Guidance (Centre for Resource Solutions, 2015)

[8] As per the GHG Protocol Scope 2 Guidance, where available, 'Residual Mix Emission Rates' should be applied to electricity not purchased via contractual instruments (e.g. RECs) to avoid double counting of renewable energy attributes. Residual Mix factors are not published for Canada. As such, the provincial factors have been used in place of Residual Mix factors for the purposes of this report.

8.0 Carbon Offsets

Carbon Offsets, or Verified Emissions Reductions, are direct reductions in GHG emissions that can be purchased to 'offset' property emissions. Unlike RECs, Carbon Offsets are purchased in units of 'tonnes of CO2 equivalent' (tCO2e) and are not related to electricity purchased or consumed at a property. Carbon Offsets are purchased for some Investment Properties to offset Scope 1 emissions. Offsets are subtracted from the total location-based and market-based emissions to report 'Net location-based' and 'Net market-based' emissions.

9.0 Data Sources and Quality

The reported emissions data for each Portfolio Segment falls into three categories with respect to data quality:

Validated: Utility data entered directly from utility bills or meter readings by EPL Analysts. Itemized flight data provided from 3rd party providers.

Not validated: Utility data provided by a third party (e.g. property manager) in spreadsheet format. Non-itemized travel data provided by SLF staff and 3rd party providers.

Estimated: Consumption estimated based on a linear regression of historical consumption vs. weather data or using the portfolio average consumption intensity.

Best efforts are made to capture actual, validated source data for all emission calculations. The following sections detail the data sources and quality for each Portfolio Segment.

9.1 Investment Properties

Consumption data is obtained directly from monthly utility bills and entered in a central database by EPL's Data Integrity Analysts. Manual and automatic validation procedures are in place to identify data entry issues, billing errors and consumption anomalies. Where issues are detected, EPL follows up with the appropriate parties to ensure accuracy of the data for reporting purposes. Where verifiable utility data is not available, consumption is estimated based on a linear regression of available utility data and actual weather data. In the case of non-weather dependent accounts, historical consumption is assumed to be equal to recent year consumption.

Adjustments for pandemic:

Estimated bills during the pandemic period (March 2020 forward) are adjusted based on the actual vs. estimated values for the past three actual bills available to take into account reduced consumption during the pandemic.

9.2 CRE Properties

SLF-paid accounts

Utility bills were provided for non-Investment properties, and data was collected/entered in the same way as Investment properties.

Landlord paid accounts

SLF asked third party property managers to enter consumption data from utility bills and submeters into a spreadsheet template. Data was reviewed by EPL's Data Integrity Analysts and compared to other leased offices to identify atypical energy use intensities. Where anomalous data was identified, EPL followed up with SLF to check consumption amounts.

Multiple attempts were made by SLF to obtain utility data from third-party managers. In cases where incomplete data was provided for a given utility account, the missing data was estimated by EPL based on the data available. In cases where no data was provided for a given account, consumption was estimated by EPL based on the average utility use intensity of the CRE portfolio as of 2014.

9.3 Corporate Travel

Distances traveled were provided by SLF in aggregate for each Business Unit and mode of transportation.

Historical travel data was not available for some locations. In these cases, emissions were estimated to be equal to those of 2019 to allow for a fair comparison of 2018-2020 emissions.

10.0 Reporting Normalized Results

Normalized energy use intensity (ekWh/sqft) and emissions intensities (tCO2e/sqft) are reported for 2020 vs. 2019 for both the Investment and CRE portfolios. Emissions intensity is the metric used to determine SLF's performance against their global GHG emissions target.

10.1 Property Inclusions/Exclusions

This analysis is performed for properties owned for all of 2019 through 2020. In other words, properties acquired or disposed of in 2019 or 2020 are not included in the analyses since they were not under SLF's control for the entire period in question.

New developments are included in normalized results because they represent increased emissions resulting from SLF's activities during the period in question.

Properties where less than 75% of reported emissions are based on estimates (source data not available) are excluded from the normalized results.

10.2 Normalization for External Factors

The impact of the following factors on energy use and emissions is calculated and subtracted from the results determined per the GHG Protocol:

1. Weather
2. Occupancy

3. Exceptional Tenant Loads

10.2.1 Normalization for Weather

2019 energy and emissions are normalized to reflect 2020 weather conditions.

To do so, linear regression models are developed for 2019 consumption for each individual utility account as a function of heating degree hours (for accounts providing heating energy) and cooling degree hours (for accounts providing cooling energy) using hourly weather data from Environment Canada for the closest weather station to each property.

The 2019 models are applied to 2020 weather data to calculate, in effect, what consumption in historical years *would have been* had they experienced 2020 weather. The difference between the actual 2019 consumption, and the consumption modeled using 2020 weather provides a reasonable estimate of the impact of changes in weather on energy and emissions.

10.2.2 Normalization for Leased/Occupied Space

2019 energy and emissions are normalized to reflect 2020 occupancy levels, i.e. the amount of space that is leased/occupied. It has been assumed that electricity consumption at office and residential properties is the only utility materially affected by occupancy.

Monthly vacancy data is compiled for each property for 2019-2020. A 'gross-up amount' for each year is then calculated by assuming that if vacant space were occupied by a typical tenant, building consumption would increase by 10 kWh/vacant ft^2/year[9] for office properties, and 6,000 kWh/vacant suite/year for residential. The impact of occupancy on energy consumption is determined as the difference between the gross-up amounts in 2020 vs. 2019.

Note that portfolio energy use may increase while emissions decrease, or vice versa, depending on the electricity emission factors in the regions where the changes to occupancy occur. For example, a small increase in energy use in Alberta may result in a larger increase in emissions than the decrease in emissions resulting from a large decrease in energy use in Ontario.

Impact of Pandemic

The pandemic has resulted in a reduced number of occupants in office and retail properties, and increased time spent in residential properties by residents. Since the normalization for occupancy is based on the amount of occupied/leased space, rather than the number of occupants and time spent in properties, the impacts of these changes on energy, water, and emissions are not captured by the normalization approach at this time. Revisions to the normalization methodology are planned for the 2021 reporting year to adjust for some of these impacts.

10.2.3 Normalization for Exceptional Tenant Loads

Some tenants in Investment Properties have exceptional loads such as data centres over which SLF has no control. Where exceptional tenant loads are submetered and consumption data is available for the entire reporting period (2019-2020), they are removed from the normalized results such that increases or decreases from, for example, the addition or removal of large computer loads, do not affect the normalized results.

[9] Consistent with the method used by BentallGreenOak for gross-up calculations with respect to electricity costs.

11.0 Global Performance vs. Target

11.1 GHG Target Overview

In 2017, SLF engaged EPL to develop a target setting and tracking methodology for their Global GHG emissions in consultation with various stakeholders. A summary of the target setting and reporting methodology[10] can be found in section 11.3. Based on this methodology, SLF set medium and long term GHG emission intensity reduction targets for their Global real estate portfolio vs. a 2014 baseline as follows:

- 20% intensity reduction by 2020
- 30% intensity reduction by 2030

Global Investment properties and CRE properties (over 40,000 sqft) are included in the target. Waste is included in the Investment portfolio only, and only where actual weights are known. Only properties with 75% or greater data availability are included (per the property inclusions/exclusions described in section 10.1).

11.2 Annualized Target and Savings Approach

To track savings against these targets, normalized[11] annual savings are 'rolled-up' to compare to the 2014 base year, as follows:

1. The annual targeted % savings required in each year to meet the 2020 and 2030 targeted reductions vs. 2014 is calculated. This becomes the operational target that SLF strives to meet on an annual basis ("Annualized Target"). The following table shows the calculated Annualized % Target for SLF from 2015-2020.

Annualized % Target: 2015-2020

Year	2014	2015	2016	2017	2018	2019	2020
Cumulative Target	Base	3.7%	7.2%	10.6%	13.8%	17.0%	**20.0%**
Annualized % Target	Base	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%

In other words, SLF needs to reduce emissions by 3.7% per year in 2015-2020 to achieve a 20% reduction by 2020.

2. After each reporting year, the year-over-year normalized savings is calculated and compared to the Annualized Target for the reporting year.

3. Future years' targets are adjusted for any balance (surplus or deficit). For example, if the Annualized Target is 2%, and 1.3% is achieved, there is a deficit of 0.7% to be made up in future years.

[10] For full methodology see Global Emissions Target Setting: Sun Life Financial (Energy Profiles Limited, 2017)

[11] The impact of changing weather, occupancy (leased/occupied space) and exceptional tenant loads (where data is available), is estimated and removed from results to better reflect how the portfolio performed with respect to utility use over time.

11.3 Summary of Target Setting and Reporting Methodology

The following table summarizes SLF's target setting and reporting methodology, as per EPL's 2017 report.

SLF Target Setting and Reporting Methodology Summary

GHG Protocol: Steps in setting a GHG Target	Sun Life Target Methodology	Alignment with GHG Protocol
1. Obtain senior management commitment	Commitment from CEO	Yes
2. Decide on the target type	Intensity Target	Yes
3. Decide on the target boundary	Operations Included: Canadian Investment Properties US Investment Properties Int'l Investment Properties (2017 forward) Corporate Real Estate > 40,000 sqft Activities Included: Energy Water Waste – where 'good quality' data exists	Yes
4. Choose the base year approach	Annual Savings: Rolling Base Year Approach Cumulative Savings: Roll up of annual savings	Yes No - the GHG Protocol does not provide a method for rolling up annual savings
5. Define the target completion date	Short Term: 2020, Long Term: 2030	Yes
6. Define the length of the target commitment period	Single year (2020); single year (2030)	Yes
7. Decide on the use of offsets or credits	Operational/Internal Target: no use of RECs (i.e. location-based approach), no use of Carbon Offsets. External Reporting: use of RECs (i.e. market-based approach), and Carbon Offsets permitted.	Yes
8. Establish a target double counting policy	CRE occupied spaces in SLF Investment properties are not double counted as per Annex 1, Section 2.2.1. Some emissions may be counted by Sun Life as well as a third-party property manager.	Yes
9. Decide on the target level	20% by 2020 vs. 2014 30% by 2030 vs. 2014 (to be revisited in 2020)	Yes
10. Track and report progress	Normalized emissions are reporting to remove the impact of: weather occupancy exceptional loads changing emission factors	No - the GHG Protocol does not allow for normalization of results

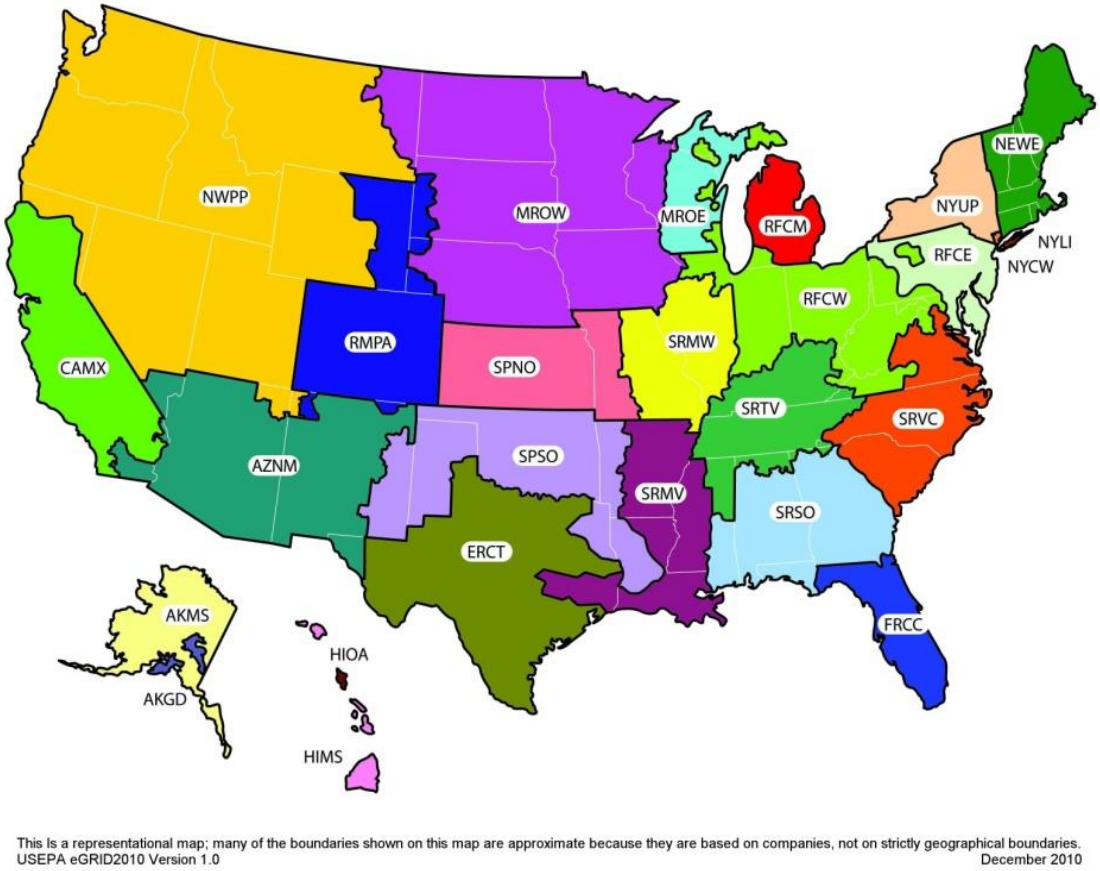
12.0 Emission Factors

Emissions were calculated using emission factors from publicly available sources wherever possible. The following sections detail the emission factors used for Canada and the US along with the source for each factor.

12.1 United States

Electricity emission factors are regionally specific. The US Environmental Protection Agency (EPA) periodically publishes the Emissions & Generation Resource Integrated Database (eGRID). eGRID assigns electricity emission factors to 'eGRID subregions', shown in the figure below, based on the generation resource mix. The factors used for reporting are the eGRID2018 factors published in 2020.

EPA eGRID Subregions



Emission factors for water are also regionally specific since they are partially based on the electrical pumping energy used to deliver water to the properties.

The following table provides the source for each emission factor used.

Emission Factors and Sources - US

eGRID Subregion	Electricity (gCO_{2e}/kWh)		Water (gCO_2/m^3)
	Location-based	Market-based (residual mix)	
AKGD	474.0	478.5	455.0
AKMS	239.0	239.0	229.5
AZNM	466.1	466.8	447.4
CAMX	226.2	226.9	1,210.2
ERCT	424.6	448.8	407.6
FRCC	424.6	426.9	407.6
HIMS	507.6	507.6	487.3
HIOA	763.2	763.2	732.7
MROE	766.4	766.6	735.8
MROW	566.6	589.6	544.0
NEWE	239.3	239.3	229.7
NWPP	291.8	296.8	280.2
NYCW	271.1	271.1	260.3
NYLI	541.2	541.2	519.5
NYUP	115.2	115.2	110.6
RFCE	326.6	326.7	313.5
RFCM	599.3	599.6	575.3
RFCW	532.5	532.7	511.2
RMPA	581.5	586.3	558.2
SPNO	531.4	567.4	510.2
SPSO	532.0	601.0	510.7
SRMV	389.4	389.9	373.8
SRMW	760.6	768.2	730.2
SRSO	468.8	471.1	450.0
SRTV	470.9	471.1	452.1
SRVC	339.1	339.9	325.5

Sources:

Electricity – location-based: EPA eGRID 2018 values, Residual mix from Green-e 2020 (2018 values)
Electricity – market-based: 2020 Green-e® Residual Mix Emissions Rates (2018 Data) (Green-e, 2020)
Water: Energy consumption for water use cycles in different countries: A review (Wakeel et al, 2016)

Non-regional Specific Utility Types

Utility Type	Emission Factor	Source
Natural Gas	1,931.4 gCO2e/m3	EPA Clean Energy Department.
Steam	79.28	Energy Star Portfolio Manager, Aug 2020 Technical Reference
Waste (trash)	1,666.50	US NIR 2020 Annex 3.14.

12.2 Canada

Provincial emission factors are published by Environment Canada. The factors used are 2018 values from Canada's Greenhouse Gas Inventory 1990 – 2018, published in 2020. The following table provides the source for each emission factor used.

Emission Factors and Sources - Canada

Utility Type	Province	Factor	Units	Source
Electricity	AB	630.0	gCO2e/kWh	National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020)
	BC	12.3		
	MB	1.3		
	NB	290.0		
	NL	26.0		
	NS	720.0		
	ON	29.0		
	PE	4.0		
	QC	1.3		
	SK	680.0		
Natural Gas	AB	1,939.4	gCO2e/m3	National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020)
	BC	1,937.4		
	MB	1,897.4		
	NB	1,912.4		
	NL	1,912.4		
	NS	1,912.4		
	ON	1,899.4		
	PE	1,912.4		
	QC	1,898.4		
	SK	1,840.4		
Water	AB	803.9	gCO2e/m3	National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020) Greenhouse Gas and Energy Co-Benefits of Water Conservation (Water Sustainability Project, 2009)
	BC	15.7		
	MB	1.7		
	NB	370.0		
	NL	33.2		
	NS	918.7		
	ON	37.0		
	PE	5.1		
	QC	1.7		
	SK	867.7		
Trash	AB	2,210.8	gCO2e/kg	National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020) Assumes 200 years of waste emissions.
	BC	1,821.7		
	MB	1,986.8		
	NB	1,758.7		
	NL	1,975.3		
	NS	1,467.0		
	ON	2,055.0		
	PE	1,578.5		
	QC	2,100.0		
	SK	1,888.8		
Deep Lake Water Cooling	ON	24.5	gCO2e/ton-h	2019 EPL Enwave Study prepared in 2020, National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020).

Emission Factors and Sources – Canada (continued)

Utility Type	Province	Factor	Units	Source
Steam	ON	74.9	gCO2e/lb	2019 EPL Enwave Study prepared in 2020, National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020).
	QC	105.7		Energy Star Portfolio Manager Technical Reference, Figure 3 (August 2020). kBTU/lb conversion factor from Energy Star Portfolio Manager Thermal Conversions (August 2015), p5
Oil	All	2,762.9	gCO2e/L	National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada (Environment and Climate Change Canada, 2020)

12.3 International

Emission Factors and Sources – International: Electricity and Water

Country	Region	Electricity Factor (gCO_2e/kWh)	Water Factor* (gCO_2e/m^3)	Source
Argentina	--	313.0	399.4	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Australia	NSWC	810.0	1,033.6	National Greenhouse Accounts Factors (Commonwealth of Australia, 2020)
Australia	VCTA	980.0	1,250.5	National Greenhouse Accounts Factors (Commonwealth of Australia, 2020)
Bermuda	--	188.0	239.9	CO_2 Emissions from Fuel Combustion; Non-OECD Americas (International Energy Agency, 2019)
Brazil	--	74.0	94.4	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Germany	--	387.0	493.8	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Great Britain	--	233.1	297.5	2020 Government GHG Conversion Factors for Company Reporting (UK BEIS, 2020)
Hong Kong	CLPG	500.0	623.5	Electricity: (CLP, 2019) Water: DSD and WSD (2018-2019) annual SR reports
Hong Kong	HKEC	810.0	623.5	Electricity: (HKEI, 2019) Water: DSD and WSD (2017-2018) annual reports
India	INDG	708.0	903.4	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Indonesia	INDO	761.0	971.0	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Ireland	--	375.0	478.5	Energy in Ireland - 2019 Report (SEAI, 2019)
Italy	--	284.0	362.4	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Japan	--	506.0	645.7	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Luxembourg	--	146.4	186.8	Total Supplier Mix from European Residual Mixes 2019 (Association of Issuing Bodies, 2020)
Malaysia	PMAL	560.0	714.6	2019 Sustainability Report (Tenanga Nasional Berhad, 2019)
Mexico	--	449.0	572.9	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019)
Philippines	LUVI	620.0	791.1	2017 Key Energy Statistics (Philippine Department of Energy, 2017)
Philippines	MIND	620.0	791.1	2017 Key Energy Statistics (Philippine Department of Energy, 2017)
Singapore	--	408.5	521.2	Electricity Grid Emission Factor and Upstream Fugitive Methane Emission factor, 2005-2019 (Energy Market Authority, Singapore Government)
Switzerland	--	10.2	13.0	Total Supplier Mix from European Residual Mixes 2019 (Association of Issuing Bodies, 2020)
Vietnam	--	518.3	661.4	Calculated from Electricity Generation by Fuel (BP Statistical Review of World Energy, 2020) and Default Emissions Factors for Stationary Combustion (IPCC, 2006)

* Except where otherwise stated, water emission factors calculated using the respective electricity factors and Greenhouse Gas and Energy Co-Benefits of Water Conservation (Water Sustainability Project, 2009)

Emission Factors and Sources – International: Natural Gas

Country	Region	Emission Factor (gCO_2e/m^3)*	Source
Germany	--	2,087.1	Germany NIR 2020, Table 84 and 563
Ireland	--	2,083.5	Ireland NIR 2020, Table 3.1.1 (Annex 3.1.A)
Luxembourg	--	2,099.0	Luxembourg NIR 2020, Table 3-93
Great Britain	--	2,022.7	2020 Government GHG Conversion Factors for Company Reporting (UK BEIS, 2020)
Switzerland	--	2,094.9	Switzerland NIR 2020, Tables 3-13, 3-14 and 3-16

* 1 Terajoule = 26,853 m3 natural gas (National Energy Board of Canada).

Emission Factors and Sources – International: Chilled Water

Country	Region	Emission Factor (gCO_2e/ton-h)	Source
Indonesia	INDO	1,157.0	Brown To Green: The G20 Transition Towards a Net-Zero Emissions Economy (Climate Transparency, 2019); 1.52 ekWh/ton-h
Malaysia	PMAL	851.4	2019 Sustainability Report (Tenanga Nasional Berhad, 2019); 1.52 ekWh/ton-h

12.4 Travel

The following table details the emission factors used to calculate emissions from corporate travel and their respective source documents.

Emission Factors and Sources - Travel

Mode of Transportation	Emission Factor	Unit	Source
Car (Tier 2 Gas)	2.3155	$kgCO_2e$/l fuel	Canada National Inventory Report (Environment Canada, 2020)
	0.2084	$kgCO_2e$/km	Canada National Inventory Report (Environment Canada, 2020), assumes 9.0 l/100 km (Natural Resources Canada)
Car Green Vehicle	0.1156	$kgCO_2e$/km	Government GHG Conversion Factors for Company Reporting (DEFRA, 2020)
Rail	0.0369	$kgCO_2e$/pkm	Government GHG Conversion Factors for Company Reporting (DEFRA, 2020)
Short Haul Flight (<1000km)	0.1184	$kgCO_2e$/pkm	Government GHG Conversion Factors for Company Reporting (DEFRA, 2020)
Medium Haul Flight (1000km<>5000km)	0.0754		
Long Haul Flight (>5000km)	0.0925		

13.0 Glossary of Terms

Base Year	The earliest year selected for inclusion in reporting for comparative purposes, as per Section 5
Effective GLA	Gross leasable area, prorated for the period of ownership in the reporting year and the equity share of the owner for whom emissions are being reported.
WTE	Waste-to-energy, as described in Section 6
kWh	kilowatt-hours of electricity
ekWh	Equivalent kilowatt-hours (all energy types)
$ekWh/ft^2$	Equivalent kilowatt-hours per square foot of Effective GLA
GHG	Greenhouse gases, for the purposes of this report: CO_2, CH_4, N_20
CO_2e	Carbon dioxide equivalent
gCO_2e	grams of carbon dioxide equivalent
tCO_2e	Metric tons of carbon dioxide equivalent
tCO_2e /1,000ft^2	Metric tons of carbon dioxide equivalent per 1,000 square feet of Effective GLA
pkm	Person-kilometre