ONTOLY

Building Emissions Reduction Standard (BERS)

Public Parameter List

Version 1.0 | March 11, 2026

1. Purpose

This document establishes the standardized parameters used across all Building Emissions Reduction Standard (BERS) projects for the Net Present Value (NPV) Financial Additionality Test (BERS Standard Section 10.3) and related quantification processes. All parameters disclosed herein are subject to annual review and verification by the contracted third-party Verification Body in accordance with BERS Standard Section 10.3.5.

2. Applicability

These parameters apply to all BERS projects undergoing additionality assessment, sensitivity analysis, and emissions quantification under BERS Standard Version 1.0. Any deviation from the standardized parameters requires documented justification and Ontoly approval, subject to the bounds defined in this document.

3. Global Warming Potential (GWP) Values

3.1 Reference Standard

Source: The most recent Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Current reference: IPCC Sixth Assessment Report (AR6), 2021—Working Group I, Chapter 7, Table 7.15.

All GWP values shall be based on a 100-year time horizon (GWP-100), consistent with UNFCCC reporting guidelines and CORSIA Emissions Unit Eligibility Criteria.

3.2 Key GWP Values

Greenhouse Gas	Chemical Formula	GWP-100 (AR6)
Carbon Dioxide	CO_2	1
Methane	CH_4	29.8
Nitrous Oxide	N_2O	273

Note: BERS building retrofit projects primarily involve CO_2 emissions from energy consumption. Refrigerant-related emissions (HFCs) shall use GWP values from IPCC AR6, Table 7.15, as applicable to the specific refrigerant compound. Current methodologies under the BERS

Standard Version 1 exclude biofuels and/or biogenic carbon dioxide and methane emissions factors so as to not double count with utility programs that claim these emissions reductions as part of regulatory frameworks in many jurisdictions.

Update protocol: GWP values shall be updated within twelve (12) months of any new IPCC Assessment Report publication, subject to Verification Body review. The effective date of the update and the prior values shall be disclosed in the revision history of this document.

4. NPV Financial Additionality Parameters

4.1 Standardized Discount Rate

Parameter	Value / Specification
Default discount rate	4.5% fixed (nominal)
Permissible range	3.0% – 10.0%
Basis	City of Toronto Retrofit Financing Guidelines; Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide (2007)
Alternative rate conditions	Building Representatives may submit an alternative discount rate within the 3.0%–10.0% bounds, supported by verifiable evidence of project-specific weighted average cost of capital (WACC).
Verification	Reviewed and verified annually by the contracted third-party Verification Body.

4.2 Energy Price Escalation Rates

4.2.1 Canada

Fuel Type	Escalation Rate	Region	Source
Natural Gas	2.0% / year	Canada (National)	Canada Energy Regulator, Canada's Energy Future 2023
Electricity	2.5% / year	Canada (National)	Canada Energy Regulator, Canada's Energy Future 2023
Fuel Oil / Propane	2.0% / year	Canada (National)	Canada Energy Regulator, Canada's Energy Future 2023
District Energy	2.5% / year	Canada (National)	Indexed to electricity escalation rate

4.2.2 United States

Fuel Type	Escalation Rate	Region	Source
Natural Gas	1.5% / year	US (National)	US Energy Information Administration (EIA), Annual Energy Outlook 2025 (AEO2025), Reference Case, Table 3

Electricity	2.0% / year	US (National)	US EIA, Annual Energy Outlook 2025 (AEO2025), Reference Case, Table 8
Fuel Oil / Propane	1.5% / year	US (National)	US EIA, Annual Energy Outlook 2025 (AEO2025), Reference Case
District Energy	2.0% / year	US (National)	Indexed to electricity escalation rate

Note: Where a project is located in a jurisdiction with materially different energy price dynamics, Ontoly may apply jurisdiction-specific or regional-specific escalation rates derived from the applicable national energy outlook (CER for Canada, EIA AEO for the United States), provided such rates are disclosed and verified. State or provincial escalation rates may be used where supported by published data from the relevant energy regulator.

Note on Derivation of US Escalation Rates: Rates are derived by Ontoly from AEO2025 Reference Case commercial sector price projections using compound annual growth rates (CAGR) calculated over the 2024–2050 projection window. For electricity, AEO2025 projects prices rising from approximately 13¢/kWh in 2024 to over 20¢/kWh by 2050, yielding an implied CAGR of 1.7–2.0%; Ontoly applies 2.0% as the national default. For natural gas and fuel oil/propane, flat to modest price growth driven by abundant domestic supply and declining building sector demand yields an implied CAGR of 1.0–1.5%; Ontoly applies 1.5%. District energy is indexed to the electricity rate, consistent with the Canadian approach, reflecting the predominance of grid electricity in US district energy systems. All derived rates are disclosed in the project's Preliminary Ex-Ante BERU Assessment Report and reviewed annually. In the event the AEO ceases to be published or is materially compromised as an independent source, Ontoly will designate an alternative reference and disclose the substitution publicly.

4.3 Utility Price Inflation Rate

Parameter	Value / Specification
Standardized inflation rate	2.0% fixed annual rate applied to utility prices in the NPV calculation
Basis	Bank of Canada inflation target (2.0%); Treasury Board of Canada Secretariat guidance
Disclosure	BERS Standard Section 10.3.4

4.4 Average Economic Useful Life (n)

BERS Standard Definition: “n” means the average economic useful life in years, as defined in the applicable Approved BERS Methodology. “t” is the year of the assessment period, where t = 1 is the first year following the Project End Date and t = n is the final year of the asset useful life (BERS Standard Section 10.3.1).

Attribute	Specification
Default value (multi-measure projects)	20 years

Single-measure projects	The technology-specific useful life from the reference table below (e.g., 15 years for an air-source heat pump installation, 25 years for a boiler replacement)
Permissible range	15–25 years
Determination rule	Single-technology project: n equals the useful life of the specific technology as specified in the reference table below. Multi-technology project: n = 20 years (the standardized default representing the weighted central estimate for a typical multi-measure building retrofit package). Ontoly may accept a project-specific alternative where the Building Representative provides a weighted average calculation based on each measure's proportional share of total projected energy savings, using the reference values below, rounded to the nearest whole year, and within the 15–25 year range.
Verification	The value of n applied to each project shall be reviewed and confirmed by the contracted third-party Verification Body as part of the additionality assessment.

Useful Life Reference Values by Measure Type:

Retrofit Measure	n (years)	Source
Air-source heat pump (residential/light commercial)	15	ASHRAE Service Life and Maintenance Cost Database
Ground-source (geothermal) heat pump	20	ASHRAE Handbook—HVAC Applications, Chapter 38, Table 4 (2019); DOE FEMP BLCC guidance
Gas/oil boiler replacement	25	ASHRAE Handbook—HVAC Applications, Chapter 38, Table 4 (2019); ASHRAE Service Life Database (median: 24–25 years for non-electric boilers)
Electric boiler	15	ASHRAE Service Life Database
Packaged/split HVAC system	15	ASHRAE Handbook—HVAC Applications, Chapter 38, Table 4 (2019)
Chiller (water-cooled centrifugal)	25	ASHRAE Service Life Database; DOE FEMP BLCC guidance
Chiller (air-cooled)	20	ASHRAE Service Life Database
Building envelope insulation	25	ASHRAE Handbook—HVAC Applications, Chapter 38, Table 4 (2019); NIST Handbook 135 (Life-Cycle Costing Manual for FEMP, 2022 Edition)
Window replacement (double/triple glazing)	25	ASHRAE Service Life Database; NIST Handbook 135
Building automation / controls upgrade	15	ASHRAE Handbook—HVAC Applications, Chapter 38, Table 4 (2019)

LED lighting retrofit	15	DOE Solid-State Lighting Program; ASHRAE Service Life Database
Variable frequency drive (VFD) installation	15	DOE FEMP BLCC guidance

Note: The default value of 20 years represents the central estimate for a typical multi-measure building retrofit package combining HVAC system replacement (15–25 years) and building envelope improvements (25 years). This is consistent with the study period conventions used in NIST Handbook 135 (Life-Cycle Costing Manual for the Federal Energy Management Program, 2022 Edition) and the DOE Building Life-Cycle Cost (BLCC) Program for federal building retrofit analysis. Where a project's dominant measure has a useful life materially different from 20 years, the project-specific value of n shall be adjusted accordingly within the permissible 15–25 year range.

Update protocol: Useful life reference values shall be reviewed against the latest edition of the ASHRAE Handbook—HVAC Applications and updated within twelve (12) months of any new edition publication.

5. Sensitivity Analysis Parameters

The following parameters and variation ranges are applied in the mandatory sensitivity analysis (BERS Standard Section 10.3.6–10.3.8) for every project that passes the NPV Financial Additionality Test.

The purpose of the sensitivity analysis is to test whether a project's additionality determination (NPV < 0) is robust. Each parameter is varied in the direction that would improve project economics (pushing NPV toward positive), thereby challenging the additionality finding. If the NPV remains negative under these stress tests, the additionality conclusion is confirmed as robust.

5.1 Parameter 1 — Capital Cost (CAPEX) −15%

Attribute	Specification
Variation applied	−15% to total retrofit capital cost
Direction tested	Downward only (lower capital cost improves project economics and pushes NPV toward positive, challenging the additionality finding)
Rationale	Reflects inherent uncertainty in cost estimation at the pre-tender design stage. ASHRAE Guideline 14-2023 (Measurement of Energy, Demand and Water Savings) identifies estimation error as a primary source of uncertainty in retrofit financial analysis. Cost estimation accuracy at the pre-tender design stage is widely recognized in the construction industry to fall within a ±15–25% range. A −15% variation tests whether the project would become financially viable if actual capital costs came in below the estimate, which is the scenario that could overturn the additionality determination. The 15% magnitude reflects the conservative lower bound of the estimation error range, consistent with the higher cost certainty provided by BERS's requirement for Eligible Validation Documentation prepared by a licensed Professional Engineer.

References	ASHRAE Guideline 14-2023, Annex B (Savings Uncertainty); Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide (2007)

5.2 Parameter 2 — Annual Energy Savings +15%

Attribute	Specification
Variation applied	+15% to projected annual energy savings
Direction tested	Upward only (higher energy savings improve project economics and push NPV toward positive, challenging the additionality finding)
Rationale	*Reflects measurement and modelling uncertainty inherent in whole-building energy performance estimates. BERS operates under the Performance Pathway specified in ASHRAE Guideline 14-2023, §4.3.2.2, where savings are derived from regression-based comparison of pre- and post-retrofit whole-building utility consumption with TMY weather applied to both. Per-project measurement uncertainty is bounded by the Existing Building Methodology Appendix 2 (§A2.1.4), which requires fractional savings uncertainty under ASHRAE 14 Equation 4-8 to be no greater than 50% of reported savings.* *This sensitivity parameter operates on top of that measurement-uncertainty bound. The Efficiency Valuation Organization's Uncertainty Assessment for IPMVP (EVO 10100-1:2019) identifies modelling uncertainty for whole-facility approaches as typically falling within a 10–20% range. A +15% variation tests whether the project would become financially viable if actual savings exceeded projections — the scenario that could overturn the additionality determination. The 15% magnitude sits at the midpoint of the recognized uncertainty range and is consistent with ASHRAE Guideline 14-2023.*
References	EVO 10100-1:2019, Uncertainty Assessment for IPMVP (Efficiency Valuation Organization); ASHRAE Guideline 14-2023, Section 4.2.11; IPMVP Core Concepts, EVO 10000-1:2022, Chapter 8.3 (The Role of Uncertainty)

5.3 Parameter 3 — Discount Rate −2 Percentage Points

Attribute	Specification
Variation applied	−2 percentage points from the standardized discount rate
Direction tested	Downward only (lower discount rate increases the present value of future energy savings, improving project economics and pushing NPV toward positive, challenging the additionality finding)
Rationale	The discount rate is consistently identified as one of the most influential parameters in infrastructure NPV analysis. A −2pp variation tests whether the project would become financially viable under more favourable

	borrowing conditions, which is the scenario that could overturn the additionality determination. This reflects the realistic range of financing conditions faced by institutional, commercial, and multi-residential building owners in Canada and the United States, where some borrowers may access capital at below the standardized rate through government-subsidized retrofit financing programmes (e.g., Canada Infrastructure Bank Building Retrofits Initiative, PACE financing). This approach is consistent with Verra's VT0008 Additionality Assessment Tool (v1.0, October 2024), developed to align with ICVCM Core Carbon Principles, which requires that investment analysis assumptions be tested for robustness under reasonable variation in key financial parameters.
References	MDPI Buildings, "Assessment Methods for Building Energy Retrofits with Emphasis on Financial Evaluation" (2025), Section 3; Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide (2007); Verra VT0008 Additionality Assessment Tool, v1.0 (October 2024); Canada Infrastructure Bank, Building Retrofits Initiative (cib-bic.ca)

5.4 Sensitivity Analysis Decision Rule

A project retains its additionality determination where the NPV remains negative (NPV < 0) under the majority of sensitivity scenarios (at least 2 of 3 tests). If the NPV becomes positive (NPV ≥ 0) under more than one sensitivity scenario, the additionality finding is not robust, and the project's additionality determination shall be reviewed by Ontoly in accordance with BERS Standard Section 10.3.8.

6. Crediting Period

Parameter	Value
Standard crediting period	10 years (BERS Standard Section 10.7.1)
Crediting period renewal	Not permitted under Version 1.0
Crediting period start date	Project End Date (completion of retrofit installation)

7. Baseline Period

Parameter	Value
Minimum baseline period	12 months of pre-retrofit utility data
Maximum baseline period	36 months of pre-retrofit utility data
Requirement	Reflective of the building's normal operating conditions

8. Pre-Purchase Buffer Recommendation

Parameter	Value / Specification

Recommended buffer	20–30% of estimated crediting period volume (BERS Standard Section 16.1.5)
Application	Non-delivery buffer in Pre-Purchase Agreements
Nature	Recommendation only; not a programme-level buffer pool

9. Quantification Unit

Parameter	Value
Unit definition	1 BERU = 1 tCO_2e (BERS Standard Section 9.1.2)
GWP conversion basis	IPCC AR6, 100-year GWP values (see Section 3 above)

10. Greenhouse Gas Emission Factors

The conversion of energy savings (kWh, GJ, m^3) to greenhouse gas emission reductions (tCO_2e) requires jurisdiction-specific emission factors that reflect the carbon intensity of the local energy supply. The following sources shall be used for all BERS emission reduction quantifications.

10.1 Canada — Electricity Grid Emission Factors

Attribute	Specification
Primary source	Environment and Climate Change Canada (ECCC), National Inventory Report (NIR), Part 3: Annex 13 — Electricity Intensity Tables
Granularity	Provincial/territorial. Emission factors are published for each Canadian province and territory, reflecting the regional electricity generation mix.
Update frequency	Published annually by ECCC. BERS shall adopt the most recently published NIR emission factors within six (6) months of publication.
Data access	Canada's Official Greenhouse Gas Inventory: open.canada.ca/data (Dataset: 779c7bcf-4982-47eb-af1b-a33618a05e5b); ECCC Emission Factors and Reference Values: canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html
Application	The provincial emission factor for the province in which the building is located shall be applied. Where a building is served by a utility with a published utility-specific emission factor that differs materially from the provincial average, the provincial factor shall still be used unless the utility-specific factor is published by ECCC or a provincial regulator.

10.2 Canada — Combustion Fuel Emission Factors

Attribute	Specification
Primary source	Environment and Climate Change Canada (ECCC), National Inventory Report (NIR), Part 2: Annex 6 — Emission Factors for Fuel Combustion
Fuels covered	Natural gas, fuel oil (#2, #4, #6), propane, diesel, wood/biomass
Gases included	CO_2, CH_4, and N_2O, converted to CO_2e using GWP values from Section 3 of this document

10.3 United States — Electricity Grid Emission Factors

Attribute	Specification
Primary source	US Environmental Protection Agency (EPA), Emissions and Generation Resource Integrated Database (eGRID)
Granularity	State-level and eGRID subregion. Emission factors are available by state and by eGRID subregion, reflecting the regional electricity generation mix.
Update frequency	Published annually by EPA. BERS shall adopt the most recently published eGRID emission factors within six (6) months of publication.
Data access	EPA eGRID: epa.gov/egrid; EPA GHG Emission Factors Hub: epa.gov/climateleadership/ghg-emission-factors-hub; EPA Power Profiler (by zip code): epa.gov/egrid/power-profiler
Application	The state-level emission factor for the state in which the building is located shall be applied. Where a building is located in a state that spans multiple eGRID subregions, the subregion factor corresponding to the building's location shall be used.

10.4 United States — Combustion Fuel Emission Factors

Attribute	Specification
Primary source	US EPA, GHG Emission Factors Hub (updated annually); 40 CFR Part 98, Subpart C, Table C-1 (Mandatory Reporting of Greenhouse Gases)
Fuels covered	Natural gas, fuel oil (#2, #4, #6), propane, diesel
Gases included	CO_2, CH_4, and N_2O, converted to CO_2e using GWP values from Section 3 of this document

10.5 General Rules

- **Vintage matching:** Emission factors shall correspond to the most recent data year available at the time of verification. Where the data year of the emission factor lags the monitoring year by more than two (2) years, the most recently published factor shall be applied with a disclosure note.

- **Conservatism:** Where multiple credible emission factors are available for the same jurisdiction and fuel type, the more conservative value (i.e., the lower emission factor, resulting in fewer BERUs) shall be applied.
- **Marginal vs. average:** BERS applies average grid emission factors (not marginal) consistent with the UNFCCC CDM and CORSIA conventions for building-sector energy efficiency projects.
- **Verification:** The emission factors applied to each project shall be confirmed by the contracted third-party Verification Body. The specific source, data year, and value of each emission factor used shall be disclosed in the Verification Report.

11. Source References

The following sources are cited throughout this document. Links are provided for verification and audit purposes. Paid or subscription-access sources are noted.

11.1 GWP and Climate Science

- **IPCC AR6 Working Group I, Chapter 7 (GWP Tables):** https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-7/
- **IPCC AR6 WG1 Chapter 7 — Supplementary Material (Table 7.15):** https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-7/ - 7.6 (Section 7.6.1.1)

11.2 Discount Rate and Cost-Benefit Analysis

- **Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide (2007):** https://www.tbs-sct.canada.ca/rtrap-parfa/analys/analys-eng.pdf
- **City of Toronto, Energy Retrofit Loans:** https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/energy-retrofit-loans/
- **Bank of Canada, Inflation-Control Target:** https://www.bankofcanada.ca/rates/indicators/key-variables/inflation-control-target/

11.3 Energy Price Escalation

- **Canada Energy Regulator, Canada's Energy Future (2023):** https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/
- **US Energy Information Administration, Annual Energy Outlook (2025):** https://www.eia.gov/outlooks/aeo/

11.4 Equipment Useful Life

- **ASHRAE Handbook—HVAC Applications (paid):** https://www.ashrae.org/technical-resources/ashrae-handbook
- **ASHRAE Service Life and Maintenance Cost Database:** https://weblegacy.ashrae.org/publicdatabase/
- **NIST Handbook 135, Life-Cycle Costing Manual (2022 Edition) [PDF]:** https://nvlpubs.nist.gov/nistpubs/hb/2022/NIST.HB.135e2022-upd1.pdf
- **DOE FEMP Building Life-Cycle Cost (BLCC) Programs:** https://www.energy.gov/femp/building-life-cycle-cost-programs
- **DOE Solid-State Lighting Program:** https://www.energy.gov/eere/ssl/solid-state-lighting

11.5 Sensitivity Analysis and Uncertainty

- **ASHRAE Guideline 14-2023, Measurement of Energy, Demand and Water Savings (paid):** https://webstore.ansi.org/standards/ashrae/ashraeguideline142023
- **EVO 10100-1:2019, Uncertainty Assessment for IPMVP:** https://evo-world.org/en/news-media/evo-news/1155-release-of-an-update-application-guide-uncertainty-assessment-for-ipmvp
- **EVO 10000-1:2022, IPMVP Core Concepts:** https://evo-world.org/en/news-media/evo-news/1280-release-of-the-new-ipmvp-core-concepts-2022
- **Verra VT0008 Additionality Assessment Tool, v1.0 (October 2024):** https://verra.org/methodologies/vt0008-additionality-assessment/
- **MDPI Buildings, Assessment Methods for Building Energy Retrofits (2025):** https://www.mdpi.com/2075-5309/15/14/2562

11.6 GHG Emission Factors — Canada

- **ECCC National Inventory Report (NIR):** https://publications.gc.ca/site/eng/9.506002/publication.html
- **ECCC Emission Factors and Reference Values:** https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html
- **Canada's Official GHG Inventory (Open Data):** https://open.canada.ca/data/en/dataset/779c7bcf-4982-47eb-af1b-a33618a05e5b

11.7 GHG Emission Factors — United States

- **EPA eGRID (Emissions and Generation Resource Integrated Database):** https://www.epa.gov/egrid
- **EPA GHG Emission Factors Hub (2025):** https://www.epa.gov/climateleadership/ghg-emission-factors-hub
- **EPA Power Profiler (by ZIP code):** https://www.epa.gov/egrid/power-profiler
- **40 CFR Part 98, Subpart C, Table C-1:** https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-C/appendix-Table%20C-1%20to%20Subpart%20C%20of%20Part%2098

12. Revision History

Version	Date	Author	Description
1.0	March 2026	Ashley Sarauer	Initial publication
1.0	May 2026	Elyse Lindgren	*§5.2 Rationale block updated to reference the Performance Pathway and the Equation uncertainty bound now operative under the Existing Building Methodology Appendix 2.* No major revisions, Version 1.0 is still accurate.