



Domestic Refrigerated Appliances Actions and Assumptions: Canada Data

The aim of this document is to detail the actions and assumptions made in interpreting and processing the data specified above during the mapping and benchmarking of domestic refrigerated appliances. It is designed to be read in parallel with the document “Domestic Refrigerated Appliances - Summary Overall Mapping and Benchmarking Approach - IEA 4E”. Section numbers in each document should align.

1 Overview of the mapping and benchmarking outputs for domestic refrigerated appliances

No data specific actions.

2 The mapping and benchmarking process for domestic refrigerated appliances

2.1 Data Cleaning and Pre-processing

2.1.1 Data cleaning

- a. Where necessary, volumes converted to litres (declared x 28.3168466).
- b. To revert to “as tested” unit energy consumption, reported chest freezer energy consumption has been multiplied by 1/0.7, and upright and compact freezer energy consumption has been multiplied by 1/0.85. These “adjusted to test” values are only used for benchmarking (i.e. not the mapping report).

2.1.2 Pre-processing

The pre-processing of data:

- Allocation of Canadian, Mapping and Benchmarking and EU product types. This allocation was based on a variety of fields supplied to define “Type” and “defrost type”. All models with a freezer volume of less than 14 litres were allocated as refrigerator only, EU type 1. Allocation for all other products as follows:

Database type	Canada type	Mapping and Benchmarking Category	EU type	Configuration ¹
1 (Where freezer configuration “inside”)	1	Refrigerator with freezer	5	Refrigerator with freezer
1 (All other freezer configurations)	1	Fridge Freezer	7	Freezer Bottom
2	2	Fridge Freezer	7	Freezer Bottom
3	3	Fridge Freezer	7	Freezer Top
4	4	Fridge Freezer	7	Side-by-side

¹ Where the freezer location is unknown, it is assumed to be below the fresh compartment.

Database type	Canada type	Mapping and Benchmarking Category	EU type	Configuration ¹
5	5	Fridge Freezer	7	Freezer Bottom
5A	5A	Fridge Freezer	7	Freezer Bottom
6	6	Fridge Freezer	7	Freezer Top
7	7	Fridge Freezer	7	Side-by-side
8	8	Freezer	8	Upright Freezer
9	9	Freezer	8	Upright Freezer
10	10	Freezer	9	Chest Freezer
10A	10A	Freezer	9	Chest Freezer
11(Where freezer configuration "inside")	11	Refrigerator with freezer	5	Refrigerator with freezer
11 (All other freezer configurations)	11	Fridge Freezer	7	Freezer Bottom
12	12	Fridge Freezer	7	Freezer Bottom
13	13	Fridge Freezer	7	Freezer Top
14	14	Fridge Freezer	7	Side-by-side
15	15	Fridge Freezer	7	Freezer Bottom
16	16	Freezer	8	Upright Freezer
17	17	Freezer	8	Upright Freezer
18	18	Freezer	9	Chest Freezer
19	19	Not used	2	Not Applicable
20	20	Not used	2	Not Applicable
Chest freezer	10	Freezer	9	Chest Freezer
Compact Chest Freezer	18	Freezer	9	Chest Freezer
Compact Upright Freezer	16	Freezer	8	Upright Freezer
Upright Freezer	8	Freezer	8	Upright Freezer

- Compartments within the various Canadian unit types were allocated to one of mapping and benchmarking compartment categories based on the table below (**Note** where a third compartment was recorded, it was assumed to be a chill compartment (0°C). **Note** also that this table also gives the assumed test temperatures for each compartment for each product type under Canadian test conditions):

Canadian Categorisations ²		Fresh Comp Temp	Frozen Comp Temp	Compartment Allocations for Fresh, Frozen and "Other Compartment" Volumes (T=degC)					
				14°C >= T > 5°C	5°C >= T > 3°C	3°C > T > -2°C	-2°C >= T > -9°C	-9°C >= T > -15°C	T <= -15°C
	All units where freezer volume is <14 litres	7.22C	-9.44C		Fresh			Frozen	
1	Where freezer configuration "inside"	7.22C	-9.44C		Fresh			Frozen	
1	All other freezer configurations	7.22C	-15C		Fresh				Frozen
2		7.22C	-15C		Fresh				Frozen
3		7.22C	-15C		Fresh				Frozen

² Note that in a number of cases, more than one product type is listed under the same "Canadian categorisation" number. Refer to the adjacent description to differentiate between products.

Canadian Categorisations ²		Fresh Comp Temp	Frozen Comp Temp	Compartment Allocations for Fresh, Frozen and "Other Compartment" Volumes (T=degC)					
				14°C >= T > 5°C	5°C >= T >= 3°C	3°C > T > -2°C	-2°C >= T > -9°C	-9°C >= T > -15°C	T <= -15°C
4		7.22C	-15C		Fresh				Frozen
5		7.22C	-15C		Fresh				Frozen
5A		7.22C	-15C		Fresh				Frozen
6		7.22C	-15C		Fresh				Frozen
7		7.22C	-15C		Fresh				Frozen
8			-17.77C						Frozen
9			-17.77C						Frozen
10			-17.77C						Frozen
10A			-17.77C						Frozen
11	Where freezer configuration "inside"	7.22C	-9.44C		Fresh			Frozen	
11	All other freezer configurations	7.22C	-15C		Fresh				Frozen
12		7.22C	-15C		Fresh				Frozen
13		7.22C	-15C		Fresh				Frozen
14		7.22C	-15C		Fresh				Frozen
15		7.22C	-15C		Fresh				Frozen
16			-17.77C						Frozen
17			-17.77C						Frozen
18			-17.77C						Frozen

2.2 Production of Graphical Mapping Outputs

Local adjusted volume test methodology used:

$$\text{Total Adjusted Volume} = \text{Volume fresh} + n * \text{Volume frozen}$$

Where

USA Classification	n
Refrigerators (excluding all refrigerators)	1.44
Fridge-Freezers	1.63
Freezers	1.73
All Refrigerators	1

Calculation of sales weighted average data:

Shipments data was supplied for:

1. Average UEC by Canadian product type by year
2. Distribution of products by type as a market share in % by year

UEC values for each of the M&B categories shown in the mapping report were calculated as follows:

For all Ca Types (1, 2, 3, n) allocated to a given M&B category in section 2.1.2:

$$UEC_{ship} = \text{Sum of (shipment weighted UEC of Ca Type 1-n * market share of Ca Type 1-n)}$$

Some Canadian product types fall into both the M&B refrigerator freezer (FF) and the refrigerator of refrigerator with a freezer compartment (R) categories. For e.g. Ca Type n, the UEC and market share for each M&B category is calculated based on an analysis of the UEC and the proportion of models of that Ca type drawn from the Canadian registration system. For Ca types that fall into both M&B categories, it is assumed³ that:

1. the proportion of shipments of FF:R for each Ca type = proportion of models of FF:R for the same Ca type within the submitted registration data.
2. the ratio of:

UEC for R category models with Ca Type n: UEC FF category models with Ca Type n
is the same for both shipments and products within the registration data.

These assumptions allow the calculation of a matrix for each Canada Type n as follows:

For CA Type n	M&B category FF	M&B category R
Shipment Weighted Average UEC		
Shipment %		

These values are then used to calculate the shipment weighted averages (UEC_{ship}) of M&B categories.

The product weighted average compartment volumes of Canadian product type n (split by M&B category FF and R when necessary) are also assumed to be the same as the shipment weighted averages for the same product type. This allows the following for shipment weighted averages:

- Calculation of the adjusted volumes both locally and to the EU test.
- Allocation of UEC to compartments for the normalisation process.
- Calculation of the EEI for the benchmarking report.

2.3 Normalisation

2.3.1 Normalisation Overview

No data specific actions.

2.3.2 Allocation of declared UEC to compartments

³ Where there was a mismatch between sales and product data availability, interpolation and/or averages from other years for the same Canadian product type were substituted.

The adaptation of the EU methodology used in this analysis requires knowledge of compartment defrost type. It is also possible that we will use information on climate class, whether or not the unit is built in and whether or not the unit has an ice maker in a separate specific piece of benchmarking analysis. These characteristics of each model were allocated based on the declared values where available and on product type when not explicitly stated. Allocation based on product type was as follows:

Database type	Defrost type	Installation type	Ice maker
1 (Where freezer configuration "inside")	Manual Defrost	Unknown	No
1 (All other freezer configurations)	Manual Defrost	Unknown	No
2	Fresh Compartment Automatic Defrost	Unknown	No
3	All Compartments Automatic Defrost	Unknown	No
4	All Compartments Automatic Defrost	Unknown	No
5	All Compartments Automatic Defrost	Unknown	No
5A	All Compartments Automatic Defrost	Unknown	Yes
6	All Compartments Automatic Defrost	Unknown	Yes
7	All Compartments Automatic Defrost	Unknown	Yes
8	Manual Defrost	Unknown	Unknown
9	Automatic Defrost	Unknown	Unknown
10	Manual Defrost	Unknown	No
10A	Automatic Defrost	Unknown	No
11 (Where freezer configuration "inside")	Manual Defrost	Unknown	Unknown
11 (All other freezer configurations)	Manual Defrost	Unknown	Unknown
12	Fresh Compartment Automatic Defrost	Unknown	Unknown
13 (where Freezer volume < 14l)	All Compartments Automatic Defrost	Unknown	Unknown
13 (where Freezer volume > or = 14l)	All Compartments Automatic Defrost	Unknown	Unknown
14	All Compartments Automatic Defrost	Unknown	Unknown
15	All Compartments Automatic Defrost	Unknown	Unknown
16	Manual Defrost	Unknown	Unknown
17	All Compartments Automatic Defrost	Unknown	Unknown
18	Manual Defrost	Unknown	No
19	Manual Defrost	Unknown	No
20	All Compartments Automatic Defrost	Unknown	No
Chest freezer	Manual Defrost	Unknown	No
Compact Chest Freezer	Manual Defrost	Unknown	No
Compact Upright Freezer	Unknown defrost type	Unknown	Unknown
Upright Freezer	Unknown defrost type	Unknown	Unknown

For the very small number of freezers labelled "Compact Upright Freezer" and "Upright Freezer", it is assumed that the majority of units will be auto defrost and a therefore a volume adjustment factor of 1.2 is used.

The installation type (i.e. whether the model is built in or freestanding) factor is not used in this analysis due to a lack of sufficient data across the majority of participants. Whilst installation type is not listed in the data, virtually all models in the Canadian market are freestanding (99.7% between 2007-10 across all refrigerator types).

2.3.3 Normalisation of “compartment EC” for test temperature variations and calculation of normalised UEC

The assumed test temperatures for each compartment for each product type are given in the table in section 2.1.2 b).

External test temperature is 32.2°C

2.3.4 Calculation of Normalised UEE

No data specific actions.

2.3.5 Calculation of normalised EEI

No data specific actions.