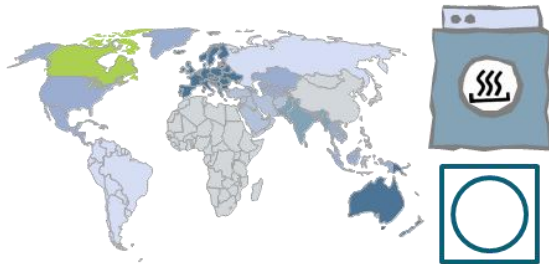
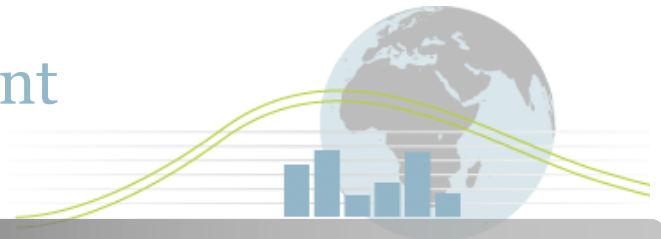


4E

Mapping Document



Country: Canada

Technology: Laundry Dryers

Sub Category: Vented and condenser electric models

Introduction

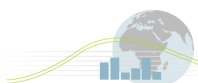
The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. Doing this ensures that comparison between the participating countries is done against a specific and consistent set of products.

The summary definition for this product is:

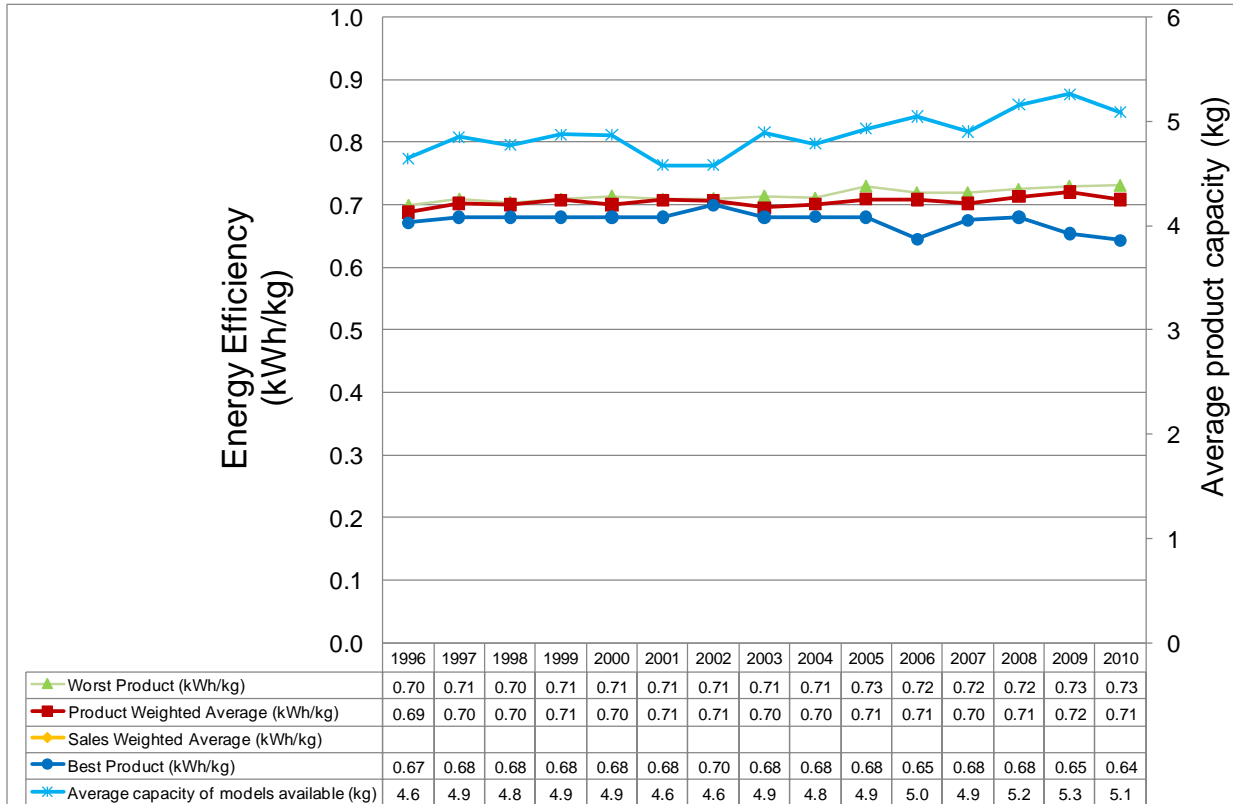
<p>Laundry Dryers defined as: <i>'An energy using appliance for use in households designed to remove the moisture of a (given) load of clothing or other textiles.'</i></p>			
<p>Data will be analysed for the following types of laundry dryer:</p>			
Laundry Dryers	Heat source	Electrical	
	Mode of drying	Tumble dryer	
	Air usage	Vented (fresh air is heated, passed through textiles and exhausted from the appliance)	Condenser (noting whether air condenser, or heat pump condenser) (air used for the drying process is dehumidified by cooling and re-circulated)
Functionality	Layout	Noted whether top loader or front loader.	
	Capacity (dry load)	Less than 10 kg. Full analysis only for appliances with capacity between 4 kg and 10 kg.	
	Wash capability	Washer dryers are excluded from the analysis.	
	Automation	To be noted whether the appliance has moisture sensor, load sensor or just timer /manual control.	

The detailed product definitions can be found at the Annex website:

<http://mappingandbenchmarking.iea-4e.org/matrix>



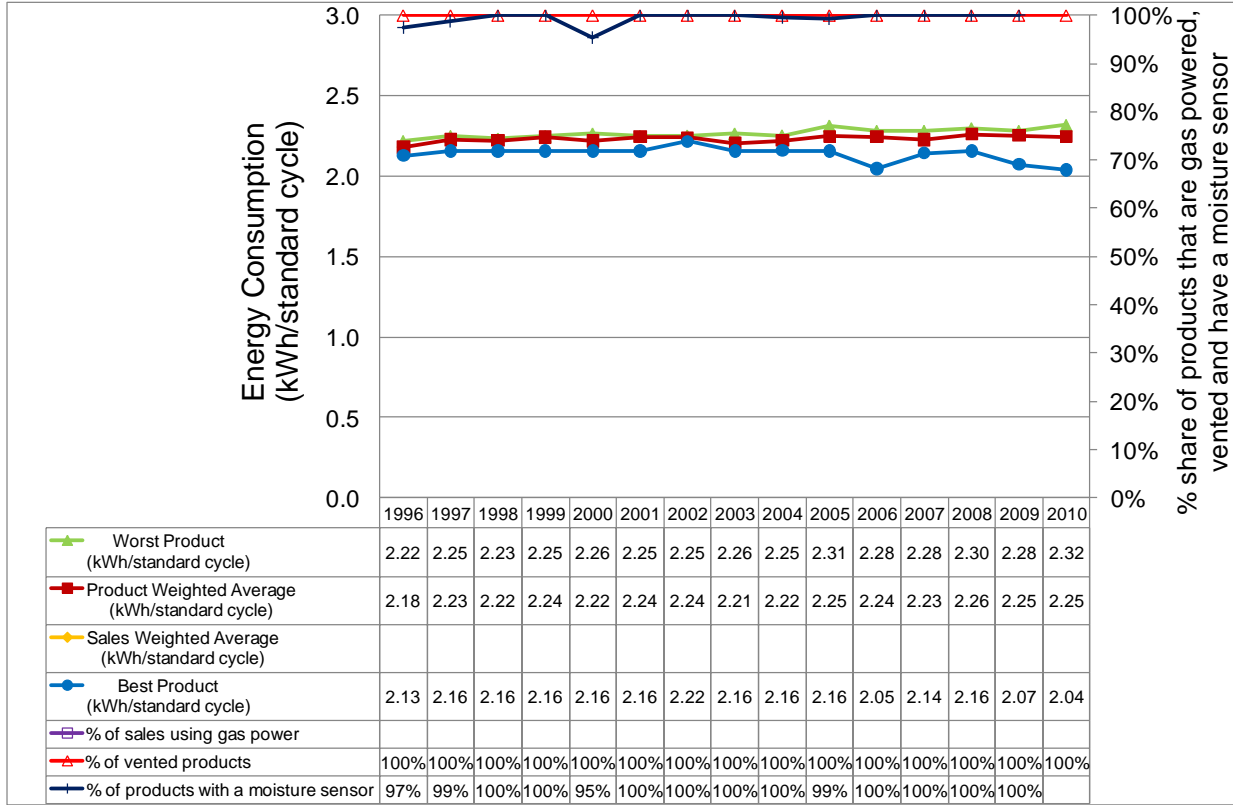
Energy Efficiency of New Laundry Dryers Canada



Key notes on Graph (see notes section 1)

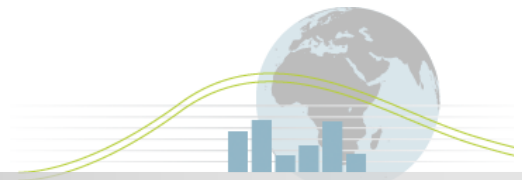
- Load capacities have been converted from Container Volumes (ft³) to loads (kg) using the rule of thumb of 38 litres per kg (see Notes on Data, Section 1 Notes on Product Efficiency).
- Analysis excludes compact models defined in this study as less than 4kg capacity, with conversions made according to the factor above, rather than excluding compact models as defined by the Canadian regulations which is less than 125 litres volume capacity.
- Unit Energy Efficiency (UEE) data was supplied by inverting the declared Energy Factor (kg/kWh).
- In order to indicate a Worst performing product that reflects the broad market (as opposed to representing perhaps a single unusual or wrongly reported product), the 'energy efficiency of worst product' is in fact the energy efficiency of the product at the 'worst 5%' point of a ranked list in the dataset. The Best performing product is that with the best energy efficiency.

Energy Consumption of New Laundry Dryers Canada

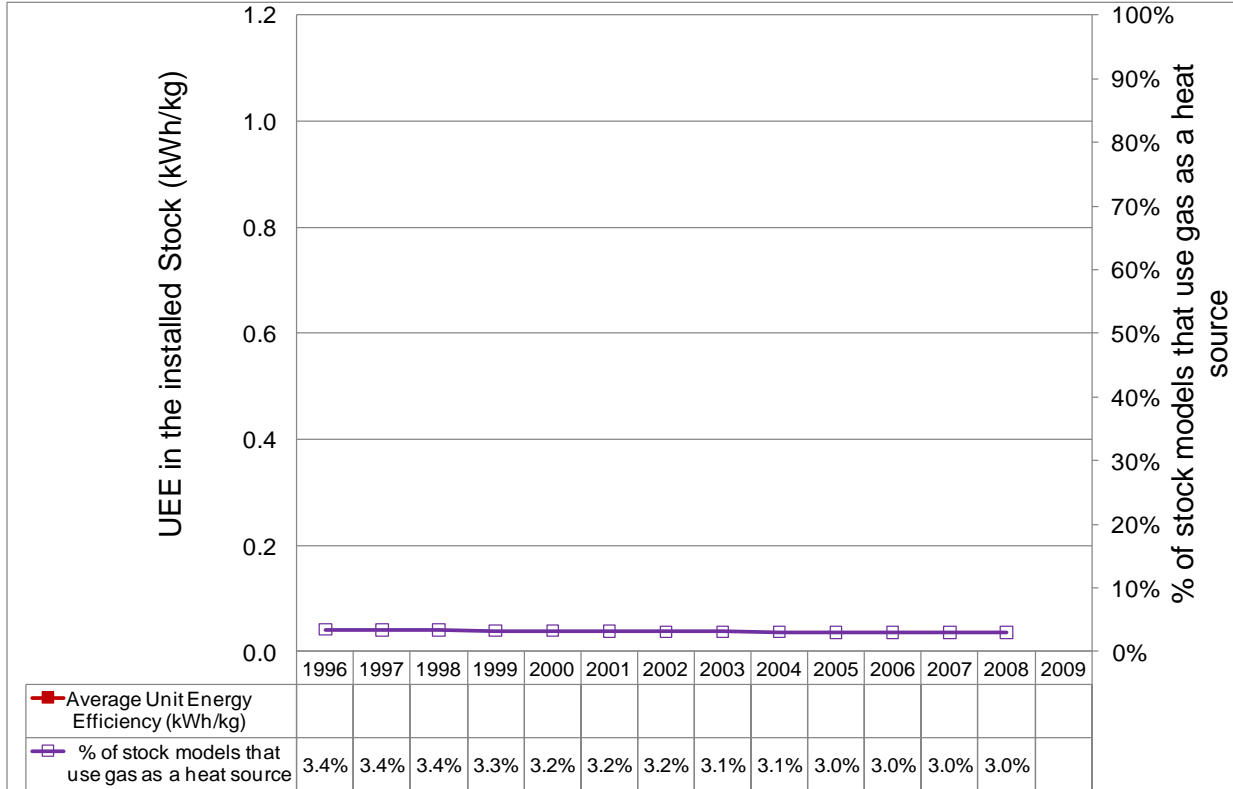


Key notes on Graph (see notes section 2)

- Unit Energy Consumption (UEC) data was supplied on a consumption per year basis and has been converted to consumption per cycle.
- The database default is to categorise products as vented unless otherwise indicated to be condensing and so % of vented products may be overstated.
- All products have moisture sensors described as either *Auto-Temp*, *Auto moisture* or *Auto Timed and Auto Moisture*.
- In order to indicate a Worst performing product that reflects the broad market (as opposed to representing perhaps a single unusual or wrongly reported product), the 'energy efficiency of worst product' is in fact the energy efficiency of the product at the 'worst 5%' point of a ranked list in the dataset. The Best performing product is that with the lowest energy consumption.

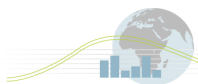


Energy Efficiency in the Installed Laundry Dryers Stock Canada

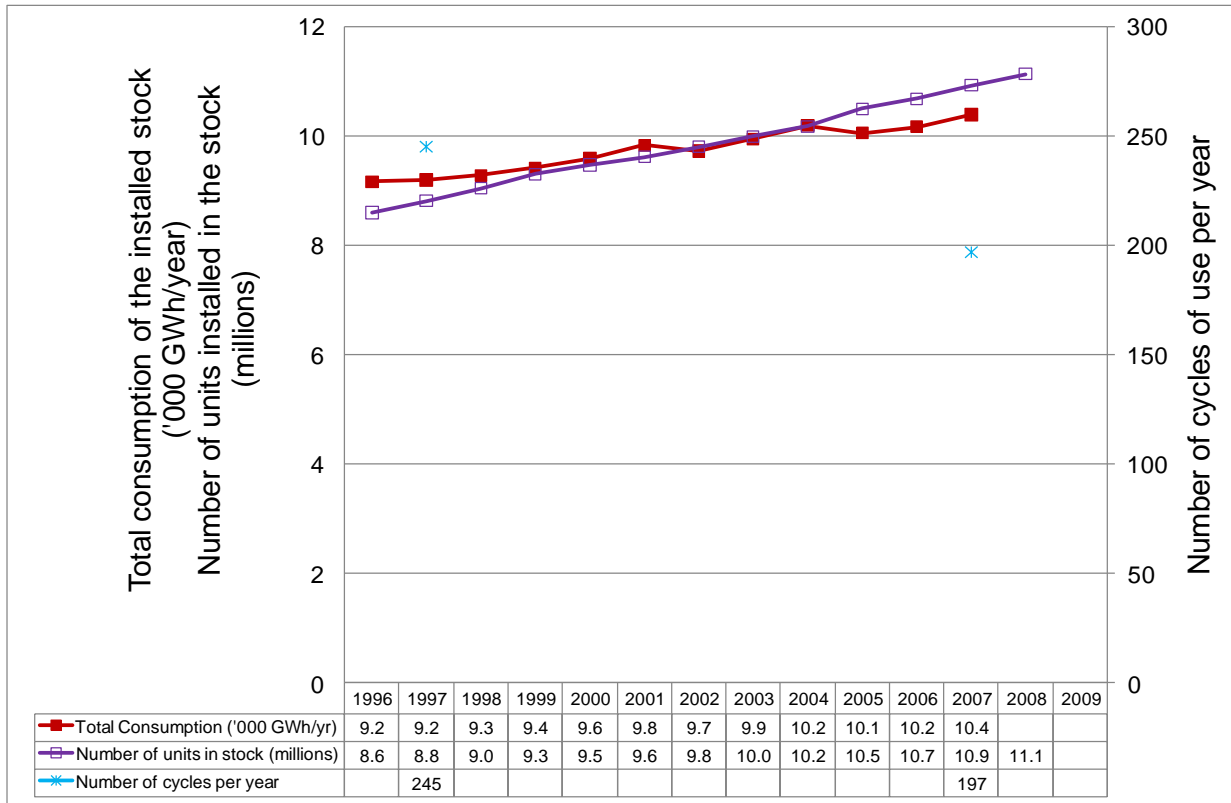


Key notes on Graph (see notes section 3)

- No data on the Unit Energy Efficiency of the typical unit installed in the stock was available to the annex at the time of publication.



Energy Consumption in the Installed Laundry Dryers Stock Canada



Key notes on Graph (see notes section 4)

- Data on washes per year is taken from household surveys in which the number of drying cycles per week in summer and winter are surveyed. Assumptions are made to generate annual averages but trends are considered reliable.

Major Policy Interventions (See notes Section 5)

Canada has two primary federal policy interventions related to the energy efficiency of washers, dryers and integrated clothes washer-dryers. Only electric dryers are subject to policies (gas appliance market is not large enough to merit regulation):

Minimum Energy Performance Standards (MEPS): The Energy Efficiency Act, enacted in 1992 (and amended in 2009), gives the Government of Canada the authority to make and enforce regulations on performance standards and labelling requirements for products that are imported into Canada or shipped across provincial and/or territorial borders for the purpose of sale or lease.

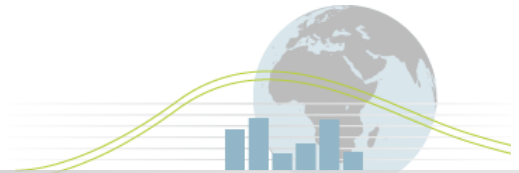
MEPS for washers, dryers and integrated clothes washer-dryers were first introduced in May 1995, shortly after the registration of the Energy Efficiency Regulations in February 1995. In December 1998, MEPS for compact clothes dryers were added to the Regulations. Since then, two amendments have been made to the Regulations concerning domestic laundry equipment. Amendment 8, published in September 2004, introduced more stringent minimum Modified Energy Factors (MEF) for residential washers and integrated clothes washer-dryers.

Generally, regulations and MEPS serve in transforming the Canadian marketplace by eliminating products with poor energy efficiency performance, while fostering a commitment to improving efficiency for energy-using equipment.

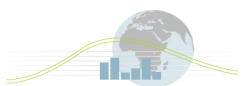
Mandatory Labelling: The EnerGuide label was introduced in 1978 under the Consumer Packaging and Labelling Act (1971), giving Canadians the opportunity to compare the energy consumption of major electrical household appliances, including washers, dryers, and integrated equipment. With the enactment of the Energy Efficiency Regulations, placement of the EnerGuide label on major electrical household appliances and room/window air conditioners became mandatory. In addition to providing the average annual energy consumption of appliances, the EnerGuide label also includes a scale showing how the given appliance compares with other similar products in terms of annual energy consumption.

Because of the similarity in technology among clothes dryer models, there is little variation among models in terms of energy performance. As such, there is no ENERGY STAR label for clothes dryers.

Conformity Assessment: Various monitoring activities are utilized achieving a high level of compliance: self-monitoring by manufacturers and dealers; monitoring by regulatory authorities including NRCAN designated inspectors, provincial partners, and Canada Customs and Border Services (CBSA); market surveys, product testing and electronic monitoring of energy efficiency reports and imports; third-party verification mark issued by independent certification organizations accredited by the Standards Council of Canada; and finally with complaints and tips from dealers, manufacturers and consumers. Compliant products are listed on NRCAN's website and in product directories for consumers, utilities, dealers, and the public.



In addition to these major policy interventions, federal, provincial and territorial governments have also introduced programs to encourage the purchase and use of energy efficient equipment, including grants, and rebate and incentives programs.



Cultural Issues (See Notes Section 6)

The total number of Canadian households with a dryer has grown only slightly from nearly 79% in 2002 to 82% in 2007.

In 2006, roughly 70% of new dryer models used between 900 and 949.9 kWh per year. The average annual energy consumption of a dryer in 2007 was 900 kWh; during the 1980s it was 1150 kWh, and during the 1990s it was 1103 kWh;

Canadians have demonstrated a clear preference for electric dryers, which represent 97% of market share, over gas dryers. This preference may be due to considerably higher costs associated with the installation of gas dryers as compared to installation costs of electric dryers.

Electric full-size dryers remain popular among Canadians, increasing in market share from almost 90% in 2002 to just over 92% in 2008; while shipments of compact-size models have also increased marginally from 2.3% in 2002 to 2.7 in 2008, distribution and sales for stacked models has declined from 8% in 2002 to 5.2% in 2008;

The average useful life of a domestic dryer is 16 years.

Notes on data

Section 1: Notes on Product Efficiency

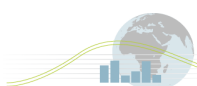
1.1 Test methodologies, Performance Standards and Labelling Requirements

The test methodology used in Canada is CSA/C361-92 and energy performance levels and test procedures for residential electric clothes dryer are harmonized with the US regulations.

The principal issues to note in the context of comparison with other countries are:

Test methodology	CSA/C361-92
Capacity metric	Volume of drum, litres
Ambient temperature for test	24°C±2°C
Ambient relative humidity for test	50%±10%
Test cloths	50% of cloths cotton; 50% of cloths easy care fabrics
Load during test	3.17 kg (7lb) dry weight cloths
Initial moisture content	70%±3.5% of bone dry
Final moisture content	3.75%±1.25% of bone dry
Metric for efficiency arising from local test	Energy Factor (EF) kg/kWh

- The average capacity of the appliances is measured in kg for this analysis. This is converted from litres to kg based upon the assumption that there is a ratio of 2.5 between the load capacity in kg of a clothes washer and a clothes dryer with the same volumetric capacity. The table which defines test loads in the North American washing machine test methodology is used to estimate the washing machine load in kg for the given volume. This equates to around 15.2 litres per kg for a washing machine and so 38 litres per kg for a dryer.
- Only appliances with capacities between 4kg and 10kg are within scope of this analysis and so the capacity conversion described above was used to convert capacity in litres to an equivalent kg for each Canadian appliance. The 4kg and 10kg limits were then applied to define the products considered in scope. This equates to a capacity scope of 152 to 380 litres.
- Note that the Canadian test methodology defines a ‘compact dryer’ as one with less than 125 litres capacity, and so is smaller than the adopted ‘compact dryer’ definition for this analysis. Energy efficiency and MEPS levels are measured as an energy factor (EF) kg/kWh (compared kWh/kg under the European system). EF it is therefore simply the inverse of efficiency in kWh/kg.
- Appliances are tested with a test load of 3.17 kg of fabric (dry weight) regardless of the capacity of the dryer (compact dryers, less than 125 litres capacity, are tested with a lower weight of fabric).



1.2 Product Efficiency Graphic

1.2.1 Data Source:

All product data is taken from a mix of sources:

- Energy Consumption of Major Household Appliances Shipped in Canada, Trends for 1990-2007, Natural Resources Canada, December 2009¹
- Major Appliance Industry Trends and Forecast, Canadian Appliance Manufacturers Association, 2008 and 2009 (confidential)
- Energy Use Data Handbook tables 1990-2007²

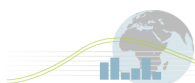
1.2.2 Data Clarifications

Data included in the analysis is shown in the table below alongside an estimate of the total numbers in the market extracted from an archive of the EnerGuide directories. The table shows that energy data was not available for all models in some years. However, given the consistency of results in all years of the analysis, it is considered that the results remain representative of the overall trend in the market.

Year	Number of standard clothes dryers from EnerGuide Directory	Number of standard clothes dryers analysed	% of total dataset analysed
1996	177	149	84%
1997	202	75	37%
1998	150	40	27%
1999	142	66	46%
2000	154	108	70%
2001	99	34	34%
2002	169	23	14%
2003	148	120	81%
2004	213	210	99%
2005	195	113	58%
2006	221	124	56%
2007	297	80	27%
2008	247	82	33%
2009	245	56	23%
2010	310	310	100%

¹ <http://oee.nrcan.gc.ca/Publications/statistics/cama09/index.cfm?attr=0>

² http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_16_e_4.cfm?attr=0



1.2.3 Glossary of energy metrics for laundry dryers:

The key metrics for laundry dryers and the key calculations undertaken in the wider Annex analysis are described below. Some metrics and/or calculations are not relevant to all data sets due to absence of data or for other reasons.

Declared Unit Load Capacity: Unit load capacity in kg is defined by local regulations and declared by manufacturers. Unit kg. Capacity for Canadian appliances is declared in litres. This is converted based on 1kg for every 38 litres (see Section 1.1).

(Note: This capacity is defined using the mixture of materials defined in the local regulations which is not necessarily in line with the mixture of material used elsewhere (for local load mix, refer to Section 1.1 on “Notes on Data”).

Unit Energy Consumption (UEC): Unit Energy Consumption is the energy consumed by the unit to complete one drying cycle as defined by local test conditions (Unit: kWh/cycle).

Sales Weighted UEC of New Models: Value calculated by [Sum of (UEC multiplied by sales volume of Model in year) for all Models] divided by [Sum of (sales volume of all Models in year)]. Unit kWh/cycle.

Product Weighted UEC of New Models: Value calculated by [Sum of (Model UEC for all models sold in year)] divided by [Sum of (Number of Models sold in year)]. Unit kWh/cycle.

Unit Energy Efficiency (UEE): Value calculated by dividing UEC by Declared Unit Load Capacity (kWh/Kg for a standard cycle). This is the inverse of the Canadian declared Energy Factor (EF, kg/kWh)

Sales Weighted UEE of New Models: Value calculated by [Sum of (UEE multiplied by sales volume of Model in year) for all Models] divided by [Sum of sales volume of all Models in year]. Unit kWh/kg.

Product Weighted UEE of New Models: Value calculated by [Sum of UEE for all models sold in year] divided by [Number of Models sold in year]. Unit kWh/kg.

Section 2: Notes on Product Consumption

2.1 Test methodologies, Performance Standards and Labelling Requirements

Calculations of total annual energy consumption for the EnerGuide label assume 416 cycles per year.

2.2 Product Consumption Graphic

See section 1.2

Section 3: Notes on Efficiency of Stock

Sources:

- Energy Use Data Handbook tables 1990-2007³
- 2007 Survey of Household Energy Use (Published in 2010)⁴

Section 4: Notes on Consumption of Stock

Sources:

- Total number of units and total energy consumption:
Energy Use Data Handbook tables 1990-2007
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_16_e_4.cfm?attr=0
- Number of drying cycles per year:
1997 and 2007 Survey of Household Energy Use
The table below shows survey results and the final annual averages. The following assumptions were made in these calculations:
 - the average cycles per week for each range of cycles per week (far right column) were assumed to be the mid-point of each range. The highest and lowest values (0.2 and 17) were then adjusted so that the average per week for both winter and summer equalled the published 1997 survey values of 5.8 and 3.6.
 - 2007 data was surveyed as 4-7 and more than 7 washes per week. The distribution of responses in these ranges into the more detailed ranges in the 1997 survey were assumed to mirror those in the 1997 data.
 - There are 26 winter weeks and summer weeks per annum.

Survey data	1997		2007		Assumed average cycles per week
	Winter	Summer	Winter	Summer	
One or less	10.9%	37.8%	13.8%	32.1%	0.2
Two to three	26.8%	23.6%	37.2%	34.0%	2.5
Four to five	21.7%	15.9%	21.9%	16.2%	4.5
6 to 7	16.6%	10.0%	15.5%	11.5%	6.5
8 to 13	16.3%	8.8%	7.8%	4.2%	10.5
14	7.8%	4.0%	3.7%	2.0%	17
Average per week	5.8	3.6	4.4	3.17	
Annual average	245		197		

³ http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_16_e_4.cfm?attr=0

⁴ <http://oee.nrcan.gc.ca/Publications/statistics/sheu07/index.cfm?attr=0>

Section 5: Notes on Policy Interventions

5.1 Data Sources

- For information on the “Energy Efficiency Act”, the “Energy Efficiency Regulations”⁵
- For information on the “EnerGuide” Label on Laundry Appliances⁶

The Canadian EnerGuide label shows the following information:

- Average annual energy consumption of the appliance in kilowatt hours (kWh)
- Energy efficiency of the appliance relative to similar models
- Annual energy consumption range for models of this type and size (for dryers the scale on the EnerGuide label extends from 400 kWh/year to 966 kWh/year for standard sized appliances).
- Type and size of the model
- Model number

Section 6: Notes on Cultural Issues

Source:

- Energy Consumption of Major Household Appliances Shipped in Canada, Trends for 1990-2007, Natural Resources Canada, December 2009⁷
- Major Appliance Industry Trends and Forecast, Canadian Appliance Manufacturers Association, 2008, 2009 and 2010 (Confidential)

⁵ http://oee.nrcan.gc.ca/regulations/home_page.cfm

⁶ <http://oee.nrcan.gc.ca/publications/infosource/pub/appliances/2009/page3.cfm?attr=4>

⁷ <http://oee.nrcan.gc.ca/Publications/statistics/cama09/index.cfm?attr=0>