European Partnership for Energy and the Environment

To the Member State Experts in the Consultation Forum

Brussels, 1 August 2014

Subject: Ecodesign Directive for Energy related Products (ErP) ENER Lot 12- Commercial Refrigerators and Freezers

Dear Expert,

In November 2012 JRC-IPTS started the work on the Preparatory Study update and in December 2012 addressed a first questionnaire to stakeholders that participated to the initial 2005-2007 preparatory study done by Bio Intelligence Services (Bio IS).

Manufacturers have contributed intensively to the background document over the past 18 months. They held 15 meetings in 2013 and 8 meetings in 2014 to prepare the input to the three questionnaires and to review the progress of the background document and the participation to the Technical Working Group Meetings in Seville on 23 April 2013 and in Brussels on 10 December 2014.

The ENER Lot 12 Joint Industry Expert Group (JIEG) of EPEE and Eurovent has already submitted a position paper on 11 June 2014 addressing its main concerns about the ecodesign and energy labelling requirements proposed by DG ENER regarding .

- the insufficient differentiation of the proposed product
- the too simple formulas resulting from the pure statistical approach
- the derivation of unacceptable Minimum Energy Performance Standards (MEPS) for the majority of the considered supermarket display cabinets and small ice cream freezers
- the importance to have a solid base for the MEPS calculation in the ecodesign requirements before any application of MEPS is considered for energy labelling.

The industry experts have taken the proposed pure statistical approach of JRC-IPTS to derive simple formulas for the reference energy consumption values of the considered supermarket display cabinets in only four different product categories as a base for further enhancements to ensure a better product segmentation by using a supporting physical model based on a differentiation by product design categories and the temperature classes and functional principles of the products.

In addition, the revision of the calculation schemes for the energy efficiency indices (EEI) and the assessment of the potential energy savings and the exclusion of all corner units and specially designed models of supermarket display cabinets from the scope of the ENER Lot 12 requirements are requested. Finally, a strict compliance of the used definitions for products and product metrics with already existing standards is strongly recommended by the ENER Lot 12 Joint Industry Expert Group.

We trust that you will take into account these considerations in your comments to the experts at DG ENER on the proposed ecodesign and energy labelling requirements as presented at the Consultation Forum on 2 July 2014.

We ask you to share these industry concerns with other interested stakeholders and to support the request for an additional Consultation Forum on these draft regulations based on the seriousness of our indicated on the proposed ENER Lot 12 ecodesign and energy labelling requirements.

We stay at your disposal for any further enquiries.

Andrea Voigt
Director General
EPEE

Felix Van Eyken
Secretary General
EUROVENT

Copy: Mr Paul Hodson, Head of Unit, Mr Robert Nuij, Mr Santiago Gonzalez-Herraiz

EPEE *(www.epeeglobal.org) represents the heat-pump, air-conditioning, and refrigeration industry (HVACR) in Europe. Founded in the year 2000, our membership is composed of 40 industry member companies and national trade associations across Europe, realising a turnover of over 30 Billion Euros and employing more than 200,000 people in Europe.*

EUROVENT *(www.eurovent-association.eu). Eurovent, the European Committee of HVAC&R Manufacturers, is the representative of Europe's major national associations in the industry of heating, ventilation, air conditioning and refrigeration. Based on objective and verifiable data, its 19 members from 17 European states represent 1.010 companies, the majority small and medium-sized. In 2013, these accounted for a combined annual turnover of around 21 billion euros and employed more than 120.000 people. Eurovent was initially founded in 1958 and has been functioning under its current name since 1964.*

EPEE and EUROVENT Joint Industry Expert Group Position on the Preparatory Study Update Final Report for Energy related Products (ErP) in ENER Lot 12 of the EU Ecodesign Directive 2009/125/EC

1 August 2014

CONTENT

ANNEXES

1. Executive Summary

The ENER Lot 12 Joint Industry Expert Group (JIEG) of EPEE and EUROVENT herewith presents an additional position paper referring to the draft ecodesign and energy labelling requirements proposed by DG ENER in June 2014.

This position paper of the JIEG covers only the product clusters

- Supermarket display cabinets
- Small ice cream freezers
- Beverage coolers

of the energy related products (ErP) in ENER Lot 12 for commercial refrigerators and freezers of the EU Ecodesign Directive 2009/125/EC.

2. Introduction

The ENER Lot 12 Joint Industry Expert Group (JIEG) of EPEE and EUROVENT has presented an additional position paper on 11 June 2014 referring to the draft ecodesign and energy labelling requirements proposed by DG ENER based on the Preparatory Study Update Final Report of JRC-IPTS published in April 2014.

One central statement in this position confirms that supermarket display cabinets show a huge variety resulting in hundreds of product models varying on

- product geometry (length, depth, height)
- merchandising style (horizontal, semi-vertical, vertical)
- design category (wall-site, island-site, back loading, front loading, etc.)
- food accessibility (open products, closed products)
- food storage application (chilled food and frozen food)
- temperature range (different temperature classes)
- refrigeration provision (remote central system, integrated local system)

This variety of products was not considered in the draft ecodesign requirements proposed by DG ENER, as it specifies only reference energy values (RTEC) for

- one vertical/ semi-vertical/ combined refrigerator product category
- one horizontal refrigerator product category
- one vertical/ semi-vertical/ combined freezer product category
- one horizontal freezer product category

without any further differentiation between

- different design categories
- open and closed products
- different temperature classes
- remote display cabinets and integral plug-in cabinets

Another critical point in the draft ecodesign requirements proposed by DG ENER were the assumed energy saving potentials and the calculation of the yearly energy consumption of the considered ENER Lot 12 products.

3. Options for better product segmentations

The ENER Lot 12 Joint Industry Expert Group (JIEG) of EPEE and EUROVENT has done further assessments of the available product data for supermarket display cabinets. The analysis has shown that a pure statistical approach as proposed by JRC-IPTS will not result in acceptable regressions.

The available around 2.600 product data points cover a wide variety of product categories with different specifications. These different product categories cannot be represented by one single linear regression model, because it does first and foremost not take into account the broad offer of different product designs in the market of the EU and hence, an appropriate product segmentation.

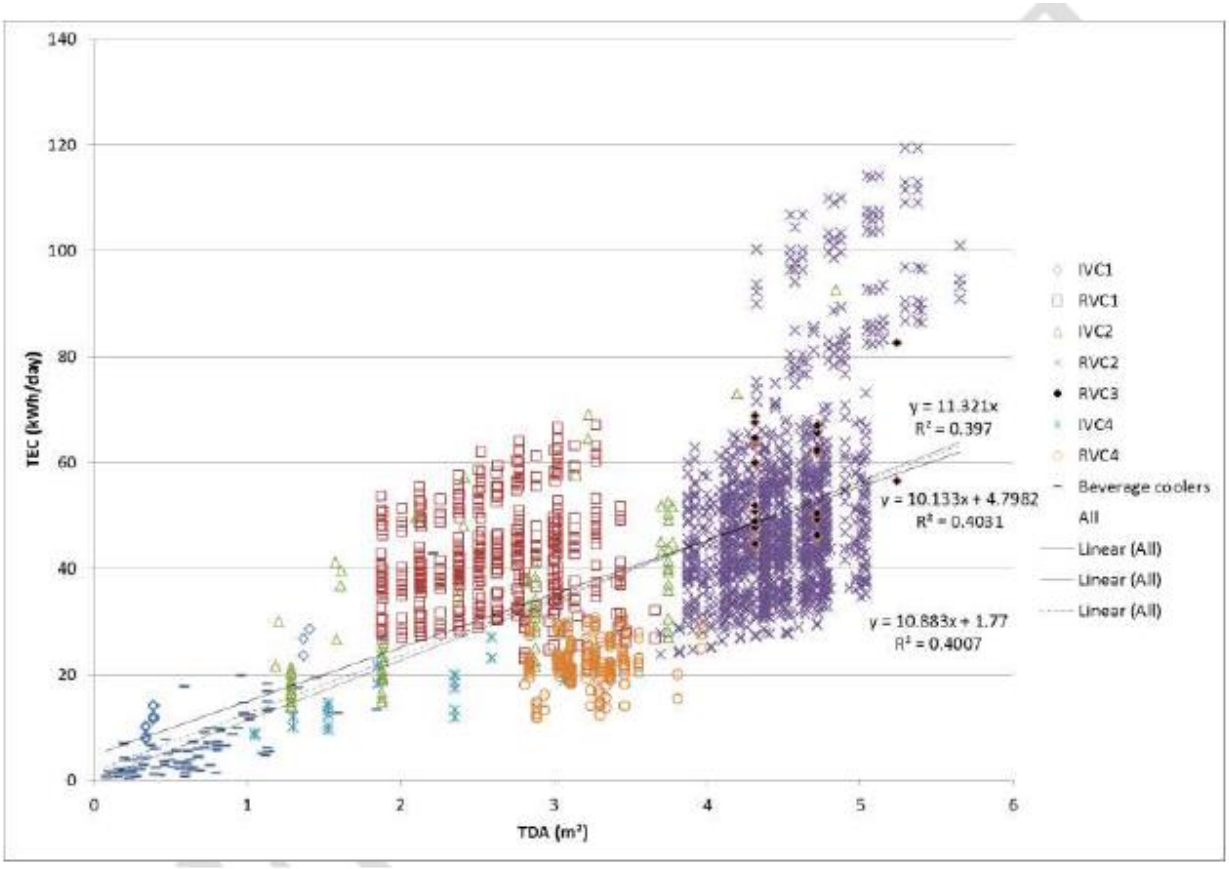


Chart 1 : Cloud of data points for semi-vertical, vertical and vertical roll-in chiller display cabinets and beverage coolers

Observing the huge fluctuations around three different regression functions in the chart above of the vertical/ semi-vertical/ combined refrigerator product category, it becomes clear that the displayed product data points cover individual clusters of very narrow TDA segments. Minor changes in this set of segmented product data points will result in significant different regression functions.

Another parameter for the product segmentation is the temperature class of the product considered. The charts below show the influence of the temperature class on the data points of one specific product category : VC2- vertical multideck refrigerator products.

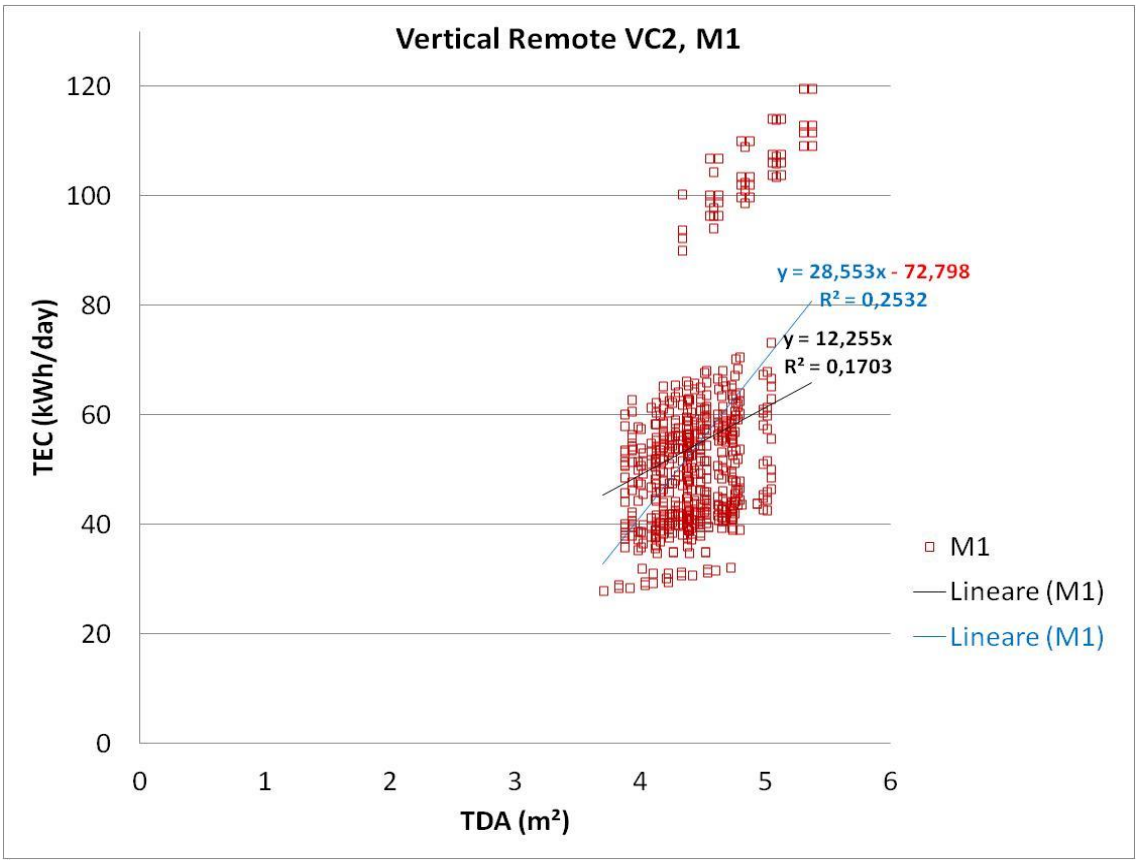


Chart 2 : Segmented data points for vertical chiller display cabinets in temperature class M1

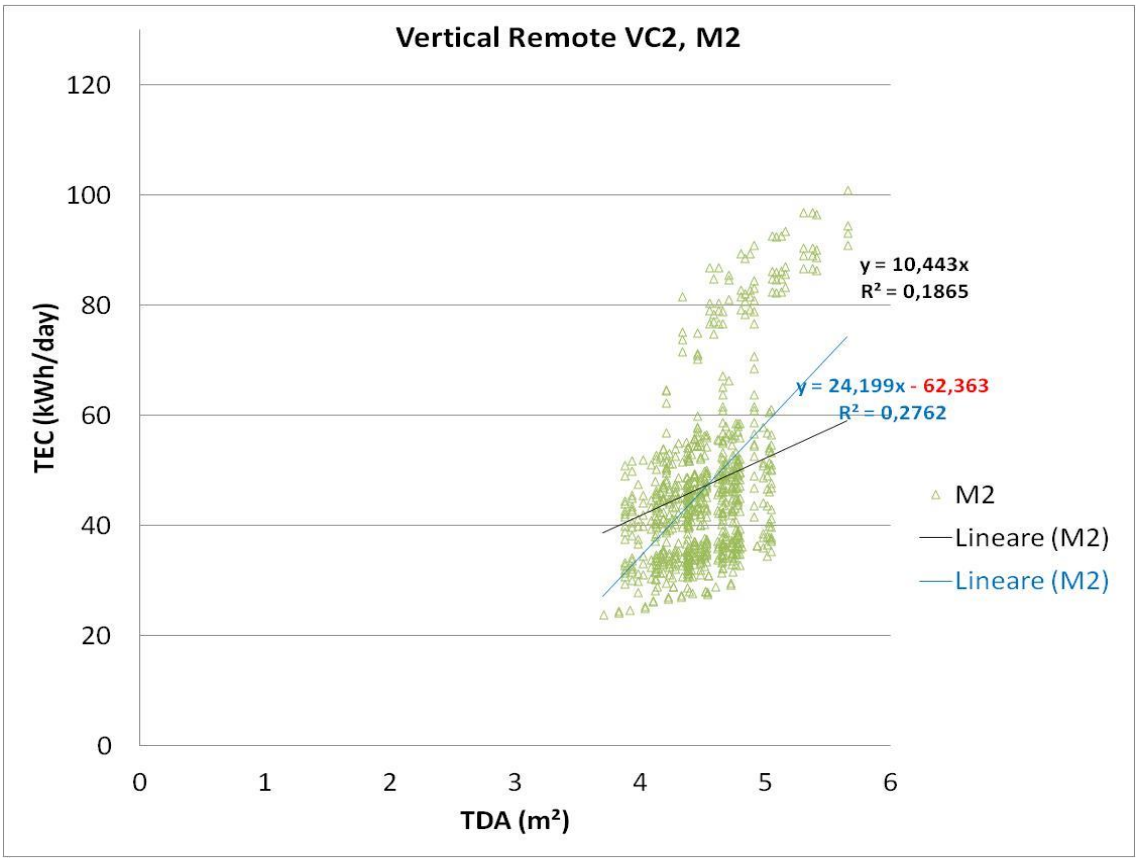


Chart 3 : Segmented data points for vertical chiller display cabinets in temperature class M2

The charts above demonstrate also that further product data segmentations do not result in acceptable linear regression functions based on pure statistical analysis. It becomes clear that a supporting physical model is required as a base.

A sufficient number of data points per product segment (at least 400 to 500 data points per segment) would provide a possible solution. This line of thought highlights also the need to verify the base assumptions (enough product data points available?), that have led to the U.S. and Australian developments.

Because within the available around 2.600 product data points not enough data points per product segment are available, the ENER Lot 12 Joint Industry Expert Group (JIEG) has developed a concept to support the statistical analysis based on additional physical elements with a step by step approach.

Step 1 : TEC-TDA (length) correlation

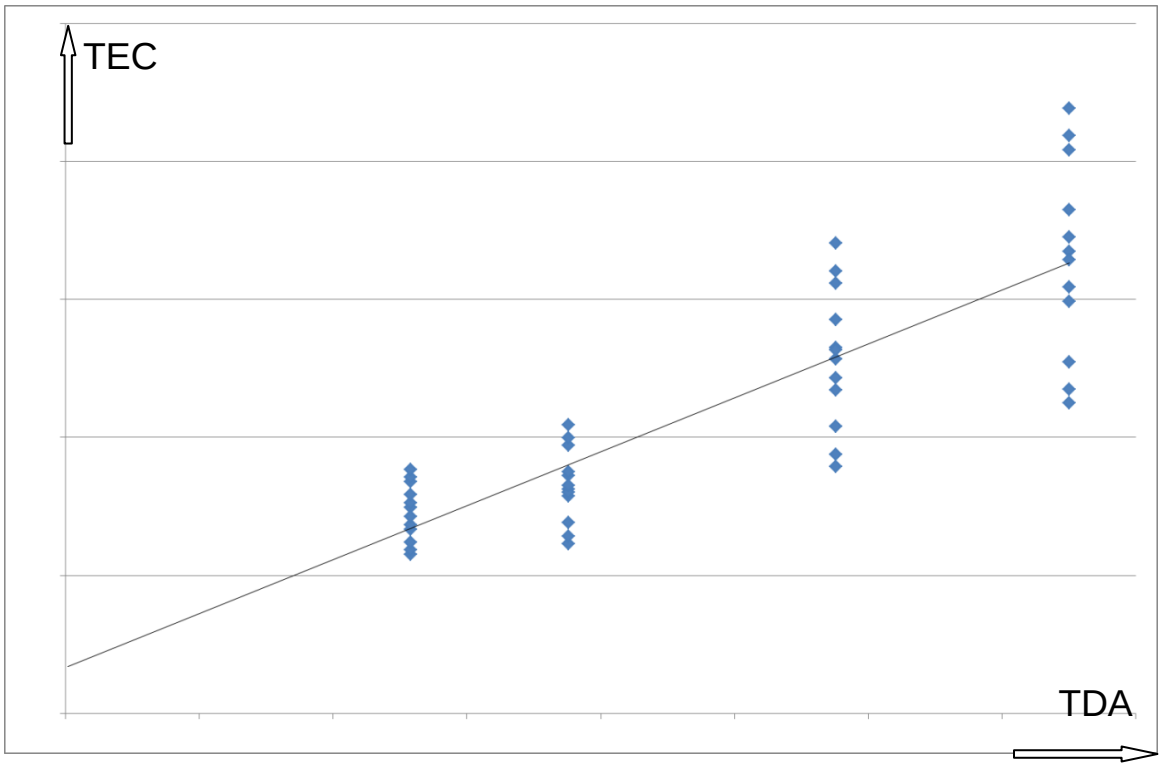


Chart 4 : Segmented data points for vertical chiller display cabinets with different fittings and accessories

The dependency of the Total Energy Consumption TEC from the Total Display Area TDA (length) of a specific product has been evaluated for a representative supermarket display cabinet model with the same technology and temperature performance for different product length modules.

Step 2: TEC-temperature class correlation

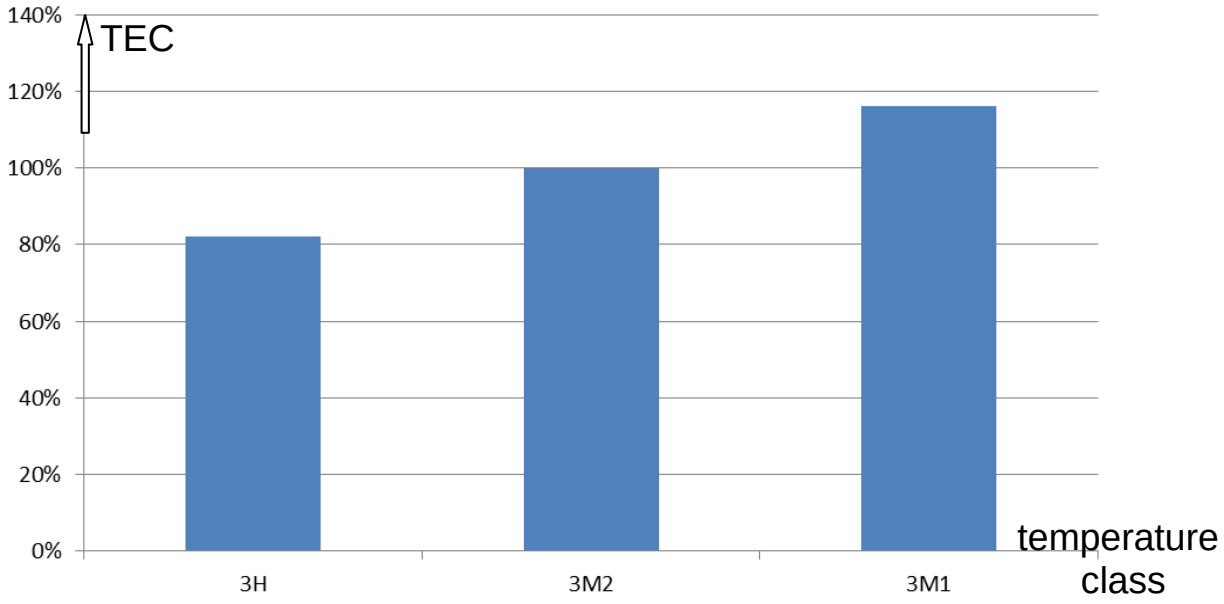


Chart 5 : Comparison of comparable vertical chiller display cabinet models in different temperature classes

The dependency of the Total Energy Consumption TEC from the temperature class has been evaluated next for a representative supermarket display cabinet model that is available in three different temperature classes.

The temperature class 3M2 has been selected as the reference base of 100% for the comparison with the temperature classes 3M1 and 3H. No reference to the temperature class 3M0 has been made due to a lack of available data points.

Step 3: Mean Value

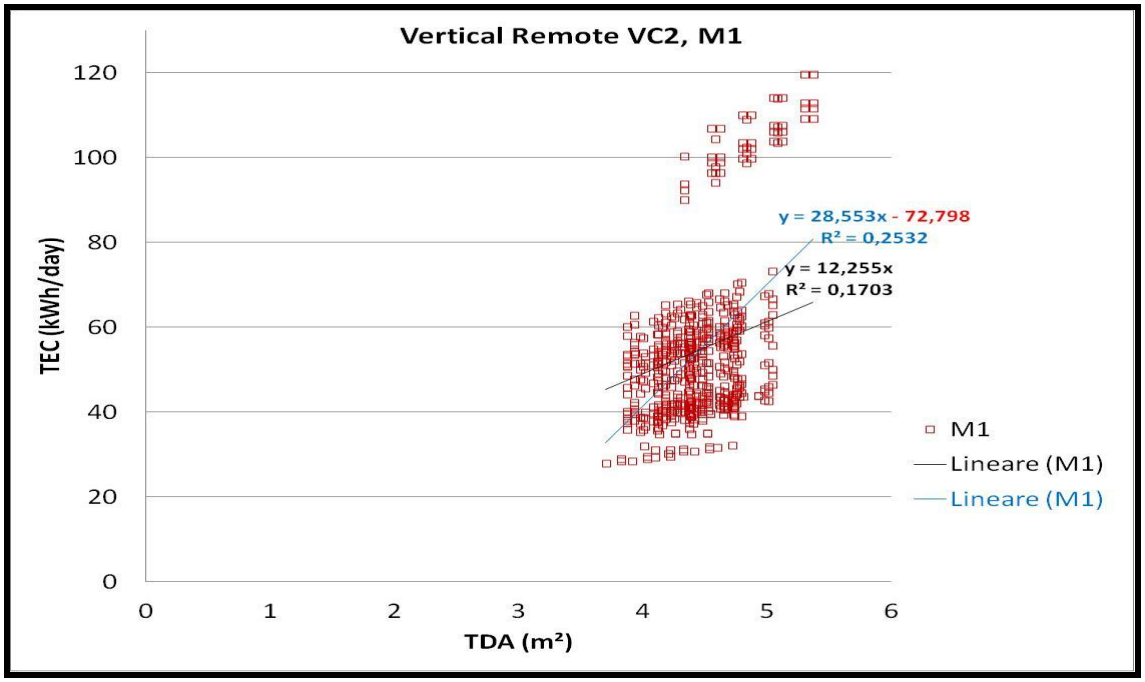


Chart 6 : Segmented data points for remote vertical chiller display cabinets in temperature class M1

In a next step, the mean values out of the segmented cloud of data points per product category have been analysed.

Step 4: Physical regression model

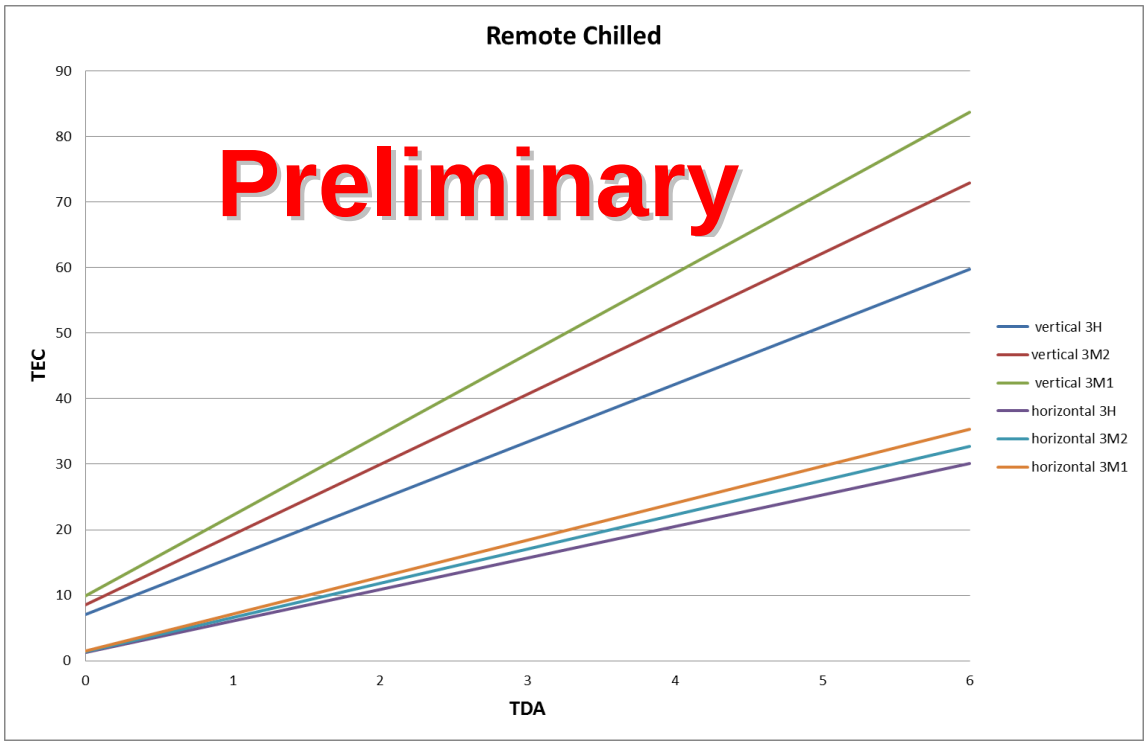


Chart 7 : Regression functions for remote vertical and horizontal chiller display cabinets in different temperature classes

The ENER Lot 12 Joint Industry Expert Group (JIEG) has then created a physical regression model showing the Total Energy Consumption TEC in correlation to the Total Display Area TDA per product category for the different considered temperature classes.

Step 5: Conversion of remote product data to integral plug-in product data

As the number of the available product data points for integral plug-in supermarket display cabinets is very limited, several elements have been considered.

The efficiency of integral plug-in supermarket display cabinets is lower than the comparable efficiency of remote supermarket display cabinets due to physics :

- COP of small compressors lower than COP of big compressors
- condensing temperature for integral products higher than for remote products
- smaller cabinet dimensions allow higher impact from boundary effects

These physical effects would be roughly reflected by the formula :

$$TEC_{integral\ products} = 1{,}25 * TEC_{remote\ products}$$

But as some boundary effects are already reflected in the TEC-TDA correlation, an adjustment of this formula as follows is proposed by the ENER Lot 12 JIEG :

$$TEC_{integral\ products} = 1{,}10 * TEC_{remote\ products}$$

Step 6: Summary of the regression analyses

		M	N
Remote **Vertical** Chilled	3H	7,02	8,79
	3M2	8,56	10,72
	3M1	9,84	12,32
Remote **Semi-Vertical** chilled (≤ 1,60m)	3H	tbd	tbd
	3M2	tbd	tbd
	3M1	tbd	tbd
Remote **Roll-In** Chilled	3H	tbd	tbd
	3M2	tbd	tbd
	3M1	tbd	tbd
Remote **Horizontal** Chilled	3H	1,27	4,81
	3M2	1,38	5,23
	3M1	1,48	5,65
Remote **Vertical** Frozen	3L1	7,51	19,34
	3L2/ 3L3	6,76	17,4
Remote **Horizontal** Frozen	3L1	3,98	10,27
	3L2/ 3L3	3,66	9,45

Preliminary

Table 1 : Regression coefficients M and N for regression function TEC = M + N x TDA of supermarket display cabinets

This initial approach needs to be completed for the RVC1 and RVC3 segments.

4. Proposed MEPS

In accordance with the draft ecodesign and energy labelling requirements proposed by DG ENER in June 2014, the ENER Lot 12 Joint Industry Expert Group (JIEG) would support linear functions to calculate the reference energy values (RTEC) in dependency from the Total Display Area (TDA) or the Volume (V) of the considered products like

$$\mathbf{RTEC = M + N \times TDA} \quad \text{or}$$
$$\mathbf{RTEC = M + N \times V}$$

The ENER Lot 12 JIEG considers this approach as generally feasible and recommends only to apply a better product segmentation for the definition of the Minimum Energy Performance Standard (MEPS) as described above.

As a result of this more detailed product segmentation, the Minimum Energy Performance Standard (MEPS) for supermarket display cabinets would be calculated with the respective regression factors M and N in the summary table of step 6 for the product categories

- remote vertical refrigerator products
- remote semi-vertical refrigerator products
- remote vertical roll-in refrigerator products
- remote horizontal refrigerator products
- remote vertical/ semi-vertical/ combined freezer products
- remote horizontal freezer products

with the displayed segmentation of the individual temperature classes per product category. The respective Minimum Energy Performance Standard (MEPS) of the integral plug-in supermarket display cabinets would then be calculated according to the formula :

$$TEC_{\text{integral products}} = 1{,}10 * TEC_{\text{remote products}}$$

For small ice cream freezers, a clear differentiation versus integral plug-in horizontal supermarket freezer display cabinets is urgently needed and separate reference energy values (RTEC) in accordance with EN 23953 at least need to be given for the following product categories in temperature class L1 :

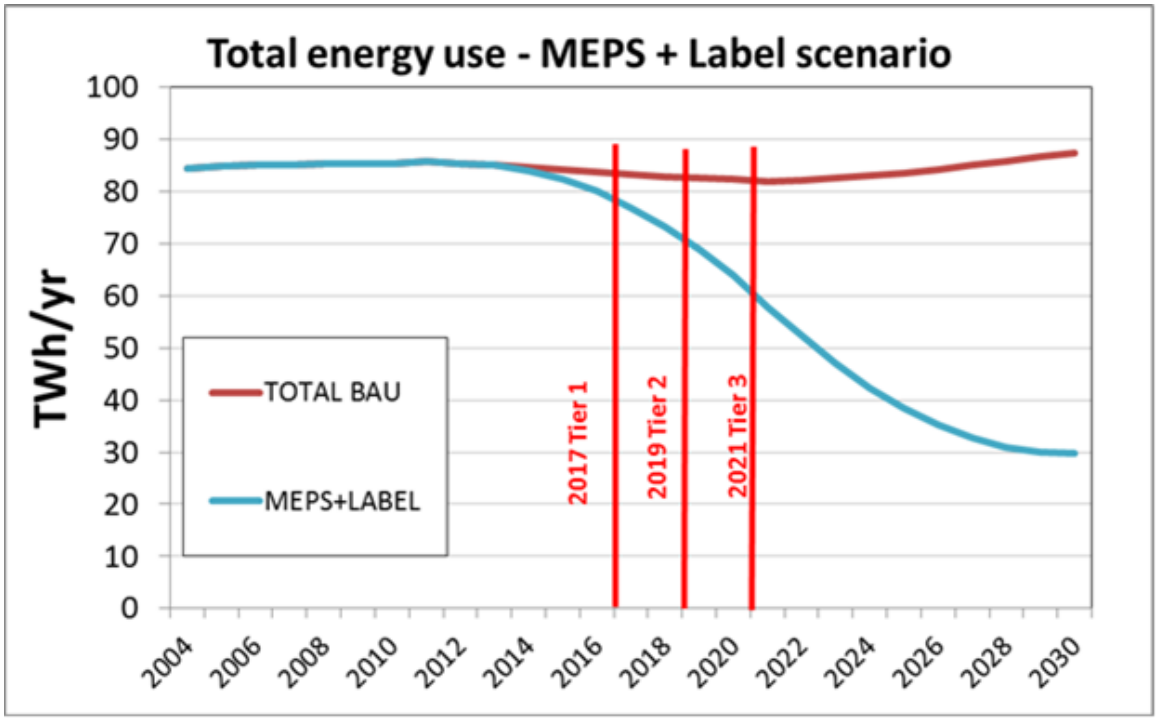
- chest freezer type : insulated top lid
- chest freezer type : glass top lid
- island freezer type : glass top lid

The Market Surveillance Offices in the EU member states will have then a set of MEPS available for validation that reflects the real performance of the checked products much more reliable than the simple formulas from the regression analyses for four non-representative supermarket display cabinet models and one non-representative small ice cream freezer model.

5. Yearly energy consumption and energy saving potentials

The draft ecodesign and energy labelling requirements proposed by DG ENER in June 2014 indicate 18 TWh/ year in 2020 and 58 TWh/ year in 2030 as estimated energy savings for the proposed implementing measures, of which the **supermarket display cabinets** alone shall contribute

- **12 TWh/ year** in **2020**
- **42 TWh/ year** in **2030**



The ENER Lot 12 JIEG needs to stress out that this estimated yearly energy savings for the supermarket display cabinets are by far over-exaggerated as these assumptions are based on Annual Energy Consumption (AEC) figures for the considered products that reflect energy consumption of these products measured for one day under laboratory conditions at 25°C and 60% relative humidity multiplied with 365 days for one entire year.

The reality in European supermarkets looks rather different as the ambient temperatures and the relative humidity in the stores show substantial fluctuations over the year and are well below the reference values under laboratory conditions. Thus the real yearly energy consumption of the considered products will accrue to maximum 40% to 50% of the Annual Energy Consumption (AEC) values resulting from the proposed calculation scheme in the draft ecodesign and energy labelling requirements for ENER Lot 12 products.

Thus, the yearly energy savings of **supermarket display cabinets** based on the proposed implementing measures will contribute not more than **5-6 TWh/ year** in **2020** and it will never reach **350%** of those savings within the following 10 years up to **2030** (which would then theoretically equal **17-21 TWh/ year**).

6. Products to be excluded and standard references

The ENER Lot 12 JIEG of EPEE and Eurovent would like to reiterate its position that all corner units and all specially designed models of supermarket display cabinets shall be excluded from the considered product scope of ENER Lot 12 products as no related standards for the design and testing of such products are available.

The definitions of products and product metrics considered in the draft ecodesign and energy labelling requirements as proposed by DG ENER in June 2014 need to be checked for compliance with existing standards like EN 23953. In particular, the definitions of the total energy consumption per day (TEC instead of E24h) and the calculation of the energy efficiency indices per day instead of per year (TEC/ RTEC instead of AEC/ SAEC) need to be revised.

7. Conclusion

The ENER Lot 12 JIEG of EPEE and Eurovent has analysed the pure statistical approach to derive reference annual energy consumption values (SAEC) for four different product categories as proposed in the draft ecodesign and energy labelling requirements of DG ENER for supermarket display cabinets and small ice cream freezers in more details and has developed a step-by-step approach to identify more differentiated reference energy consumption values for these products by considering a supporting physical model based on a differentiation by product design categories and the temperature classes and functional principles of the products.

In addition, a revision of the calculation schemes for the energy efficiency indices (EEI) and the assessment of the potential energy savings are strongly recommended as the calculation of the energy efficiency indices (EEI) and the energy saving potentials of supermarket display cabinets in the ecodesign and energy labelling requirements proposed by DG ENER are based on energy consumption data per day for laboratory conditions and extrapolated for the entire year without any consideration of a climatic seasonality.

Finally, the exclusion of all corner units and specially designed models of supermarket display cabinets from the scope of the ENER Lot 12 requirements and a strict compliance of the used definitions for products and product metrics with already existing standards is strongly recommended by the ENER Lot 12 Joint Industry Expert Group.

ANNEX 1 : Scope of considered and excluded products

Products included in the scope of ENER Lot 12

1. Refrigerated retail display cabinets for sale and display of foodstuffs
2. Refrigerated retail display cabinets for sale and display of other goods
3. Serve-over counters
4. Serve-over counters with integrated storage
5. Beverage coolers
6. Refrigerated vending machines
7. Artisan gelato ice cream freezers, scooping cabinets
8. Ice cream freezers
9. Self-service counters

ANNEX 2 : Product categories of remote and integral supermarket cabinets

Application	Positive Temperature		Negative Temperature	
To be used for	Chilled foodstuffs		Frozen, quick frozen foodstuffs and ice cream	
Horizontal	Chilled, serve-over counter open service access	HC1	Frozen, serve-over counter open service access	HF1
	Chilled, serve-over counter with integrated storage open service access	HC2		
	Chilled, open, wall site	HC3	Frozen, open, wall site	HF3
	Chilled, open, island	HC4	Frozen, open, island	HF4
	Chilled, glass lid, wall site	HC5	Frozen, glass lid, wall site	HF5
	Chilled, glass lid, island	HC6	Frozen, glass lid, island	HF6
	Chilled, serve-over counter closed service access	HC7	Frozen, serve-over counter closed service access	HF7
	Chilled, serve-over counter with integrated storage closed service access	HC8		
Vertical	Chilled, semi-vertical	VC1	Frozen, semi-vertical	VF1
	Chilled, multi-deck	VC2	Frozen, multi-deck	VF2
	Chilled, roll-in	VC3		
	Chilled, glass door	VC4	Frozen, glass door	VF4
Combined	Chilled, open top, open bottom	YC1	Frozen, open top, open bottom	YF1
	Chilled, open top, glass lid bottom	YC2	Frozen, open top, glass lid bottom	YF2
	Chilled, glass door top, open bottom	YC3	Frozen, glass door top, open bottom	YF3
	Chilled, glass door top, glass lid bottom	YC4	Frozen, glass door top, glass lid bottom	YF4
	Multi-temperature, open top, open bottom			YM5
	Multi-temperature, open top, glass lid bottom			YM6
	Multi-temperature, glass door top, open bottom			YM7
	Multi-temperature, glass door top, glass lid bottom			YM8

R Remote condensing unit	V Vertical
I Incorporated condensing unit A Assisted service	Y Combined
S Self service	C Chilled
H Horizontal	F Frozen
	M Multi-temperature

General classification can be used as follows: HC1, VF1, YM5. When necessary, the classification can be more precise for example RHC1A, IVF1S

NOTE: Serve-over counters are primarily in assisted service but may be in self service Chilled multi-deck cabinets are primarily in self service but may also be in assisted service

ANNEX 3 : Temperature classes for M-packages according to EN 23953

Class	The highest temperature θah of the warmest M-package equal to or lower than °C	The lowest temperature θb of the coldest M-package equal to or higher than °C	The lowest temperature θal of the warmest M-package equal to or lower than °C
L1	-15	-	-18
L2	-12	-	-18
L3	-12	-	-15
M0	+4	-1	
M1	+5	-1	-
M2	+7	-1	-
H1	+10	+1	-
H2	+10	-1	-

ANNEX 4 : Climate Classes according to EN 2953

Test room climate class	**Dry bulb temperature** °C	**Relative humidity** %	**Dew point** °C	**Water vapour mass in dry air**
0	20	50	9,3	7,3
1	16	80	12,6	9,1
2	22	65	15,2	10,8
3	25	60	16,7	12,0
4	30	55	20,0	14,8
6	27	70	21,1	15,8
5	40	40	23,9	18,8
7	35	75	30,0	27,3
8	23,9	55	14,3	10,2

NOTE The water vapour mass in dry air is one of the main points influencing the performance and the energy consumption of the cabinets. See also Annex D to compare lab and store conditions.