Cold appliances: Global standard Product categories

Date: 1-July-2015

15204 / CE43 / V1

Stakeholder meeting Cold Appliances

On behalf of CECED

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History

D1: 25-06-2015

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IEC 62552-1,-2,-3:2015

- Many changes compared to actual EN62552:2013
- Main changes:

Item	EN62552	New Global Standard IEC62[illegible],-2,-3
Ambient Temperature [°C]	25	16 and 32 °C. Annual energy consumption $E_{total} = f\{E_{daily\text{-}16°C}, E_{daily\text{-}32°C}\}$ where f is a function to be regionally defined. Suggested: $E_{total} = F*365* E_{daily\text{-}16°C} + (1\text{-}F)*365* E_{daily\text{-}32°C}$
Fresh Food Target Temperature [°C]	5	4
Frozen Food Target Temperature (3 and 4 star compartments) [°C]	-18 warmest package	-18 average temperature of 5 or more distributed temperature sensors (no packages)

Impact is a function of F

Energy consumption increase

Energy consumption decrease

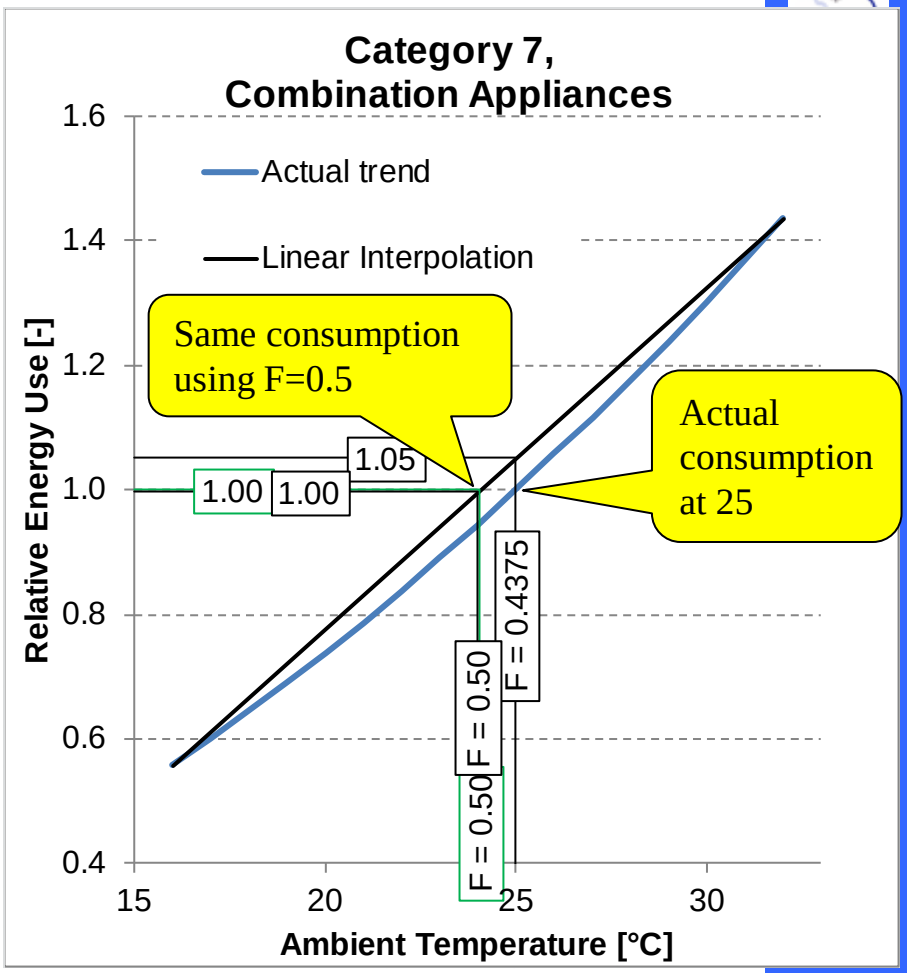
IEC 62552-1,-2,-3:2015: changes

1. Energy consumption tests:
   - Reduced uncertainty (no load packages)
   - Two ambient temperatures reduces circumvention options
   - Reduced test time for No-Frost by separate measurement of defrost energy and “steady state” part (variable defrost properly included).
   - Flexible test time algorithm (no fixed 24 hours) with guaranteed stability
   - Reduced or equal test time despite two ambient temperatures
2. Volume measurement less sensitive to interpretation
3. Storage temperature tests still with load, but much faster
4. New compartment types (e.g. pantry, wine storages)
5. Freezing capacity determination much faster
6. Cooling capacity test for refrigerators

Interpolation factor *F* options

1. Linear interpolation equivalent to 25 °C -> $F = 0.4375$
   - Proposed in CENELEC meeting
2. Linear interpolation equivalent to 24 °C -> $F=0.5$
   - Gives similar energy consumption as a real test at 25 °C, as shown by trend study and experimental analysis
   - Trend between 16 and 32 °C is non-linear (increasing slope at higher ambient temperatures)

➢ Interpolation at 25 °C increases consumption (5 to 7 %)

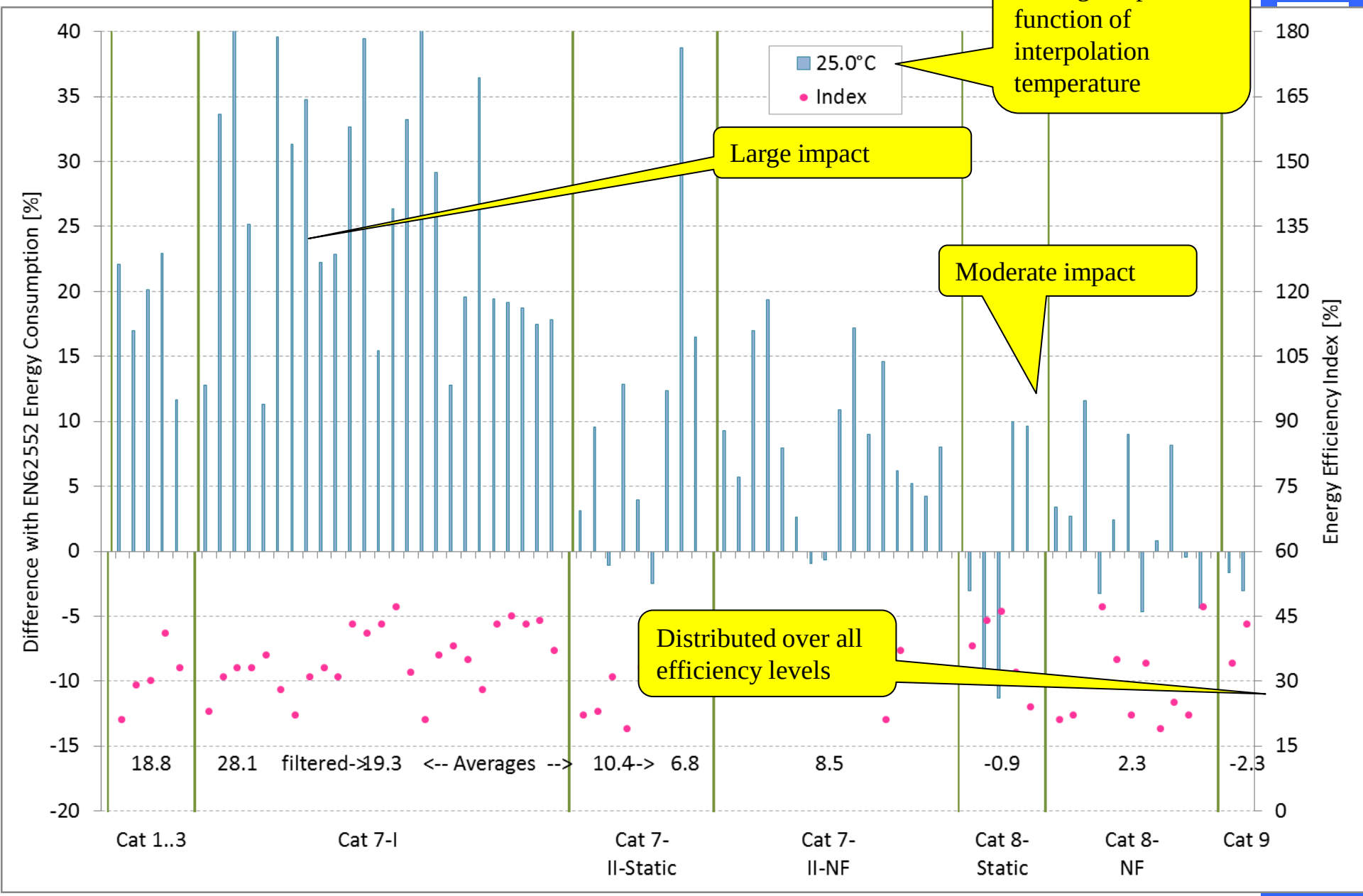


Impact on rated energy consumption

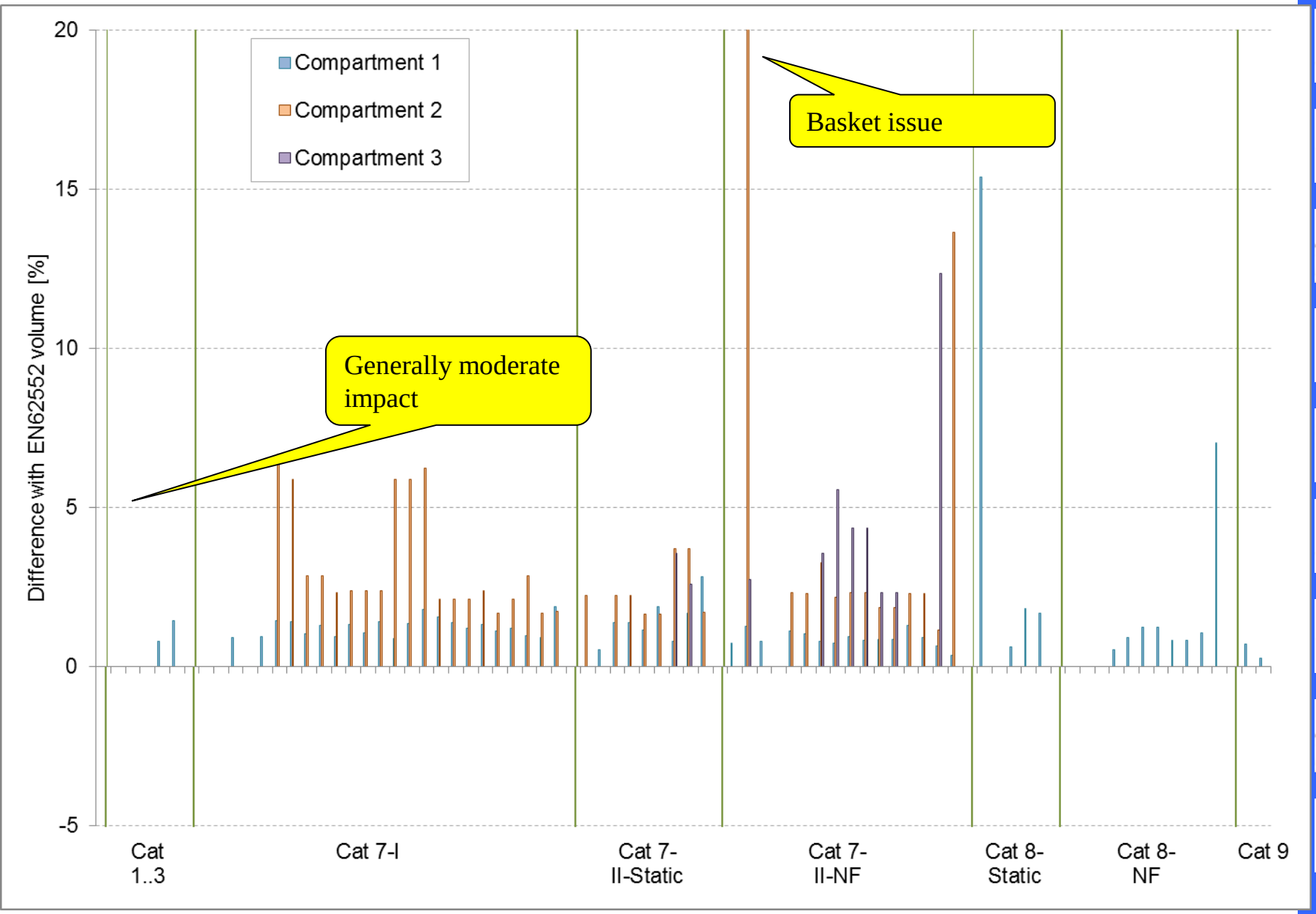
- Experimental investigation by manufacturers
- 73 products split over different categories:

Category	Main characteristic
Category 1, 2 and 3	Fridges with or without chill compartments
Category 7, single control (Type I)	Combination appliances such as top and bottom mounted freezers
Category 7, double control (Type II) + Category 10, static type	Combination appliances
Category 7, double control (Type II) + Category 10, No-Frost	Combination appliances
Category 8, static	Upright Freezers
Category 8, No-Frost	Upright Freezers
Category 9	Chest Freezers

Impact on energy consumption



Impact on volume

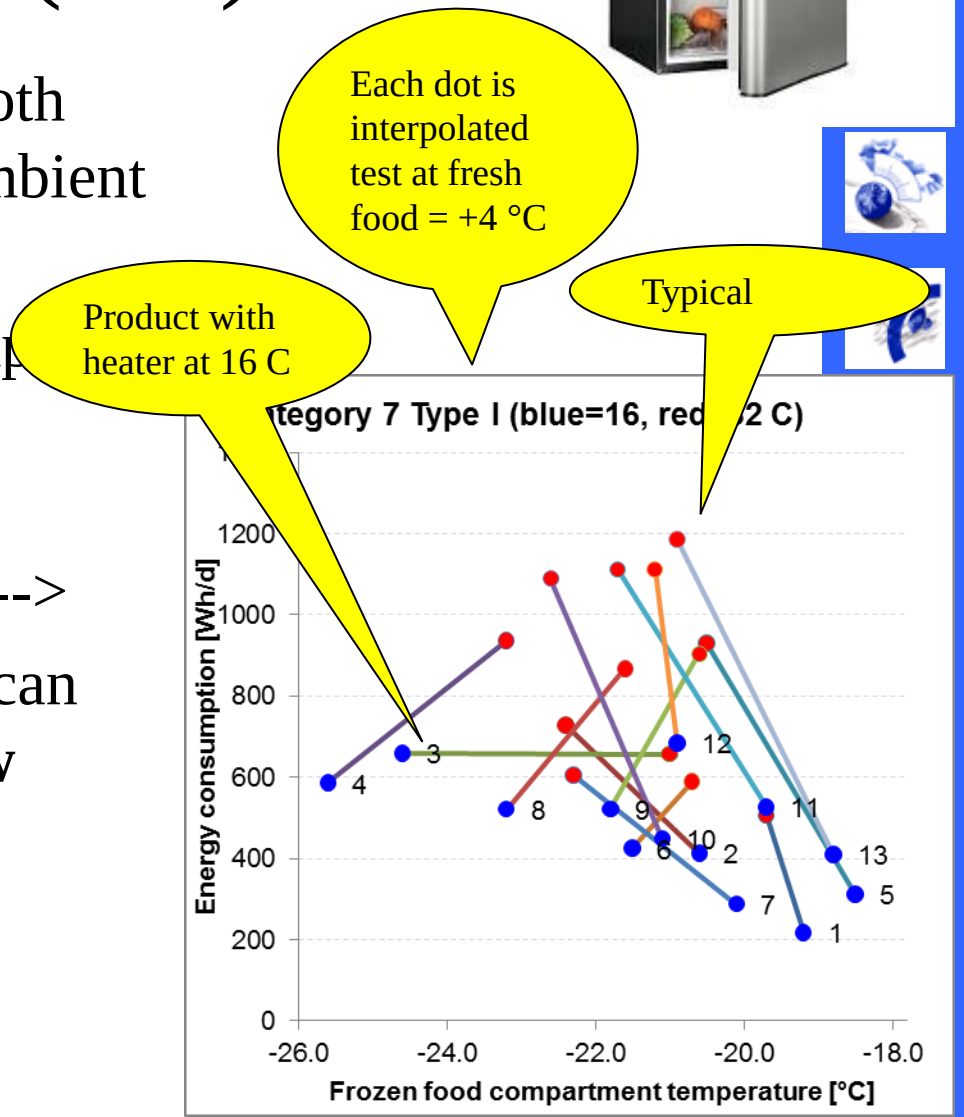


Category 1,2,3 (***R***)

- Average increase 19 % due to:
  - Reduction in target temperature (5 to 4 °C): 5 % heat load increase
  - Reduction in efficiency refrigeration system
  - Interpolation at 25 °C: +7 %

Category 7, type I (***RF***)

- Single control, can not control both compartments optimally at all ambient temperatures
- 25 appliances, large spread in imp
  +12 to +75 % (average +28 %)
- None of the appliances were optimised for the new standard --->
- 18 appliances excluded as these can be improved: **positive effect new standard (!)**
- Average increase of 7 products remaining: +19 %



Category 7, type II (***RF***)

Static

- 9 products tested: average +10 %
- 1 product had +39 %, but temperatures were not at target at 16 and 32 °C, excluded
- Remaining 8 products: average +7 % due to
  - Reduction in target temperature fresh food is compensated with increase in average temperature frozen food
  - Interpolation at 25 °C: +5 %

Frost Free

- 16 products tested: average +9 % due to:
  - Same reasons as for static
  - More impact of defrost energy due to reduced defrost intervals

Category 8 (***Fu***)

Static

- 5 products tested: average -1 % due to:
  - Higher average frozen food temperature
  - Increase in efficiency refrigeration system
  - Interpolation at 25 °C: +3 to +5 %

Frost Free

- 11 products tested: average +2% due to:
  - Same reasons as for static
  - Reduction in defrost interval (maximally 40 h at 32 °C ambient while this is now typically 72 h)

Category 9 (***Fc***)

- 2 products tested: average -2 % due to:
  - Higher average frozen food temperature
  - Increase in efficiency refrigeration system
  - Interpolation at 25 °C: +3 to +5 %

Summary of new global standard

- New standard needs interpolation between 16 and 32 °C:
  - Value used here: 25 °C (F=0.4375), but 24 °C is more close to an actual test at 25 °C
- Apart from freezers, this results in an energy increase for all products
- For cat 7 type I products, the impact can be very high
- Quantitative data supplied
- The impact on efficiency levels and maps is shown later in data analysis part

Product categories and compensations

- Efficiency levels and MEPS update is an opportunity for changes
- New categories and compensations are proposed
- Motivation for each proposed change

Proposed new categories

To be determined

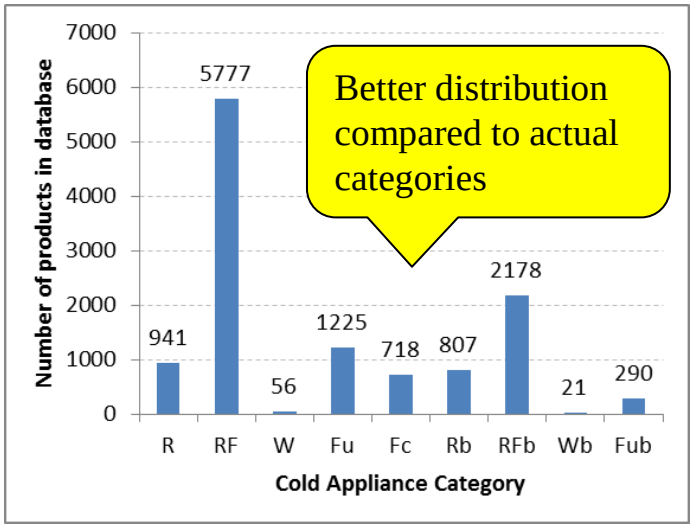
Letters to avoid confusion with existing categories

Alignment with IEC62552-1,-2,-3:2015

9 categories instead of 10

Compensations on reference lines instead of volume correction factors

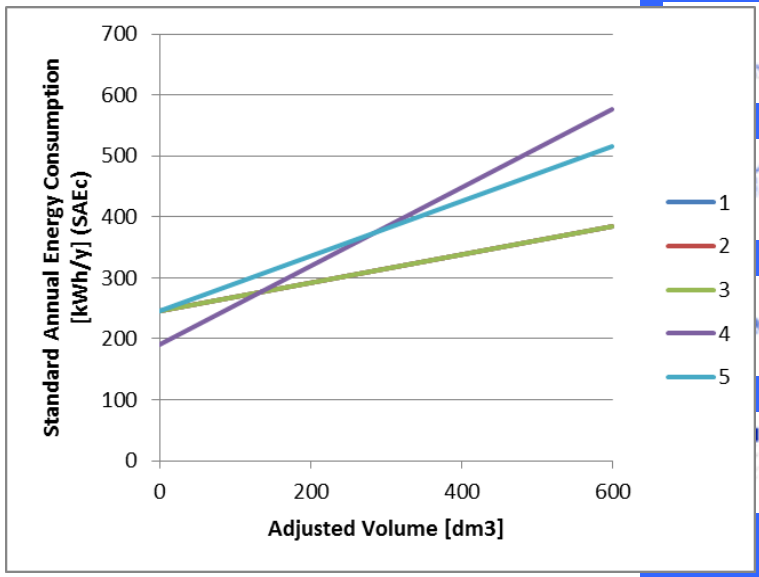
Category	Designation	*M*	*N*
	Stand alone		
R	At least one unfrozen compartment [1] and optionally one or more other compartments from the types unfrozen, one-star or two-star	t.b.d.	t.b.d.
RF	At least one unfrozen compartment and at least one freezer [2] compartment	t.b.d.	t.b.d.
W	Wine storage appliance	t.b.d.	t.b.d.
Fu	Upright freezer [3]	t.b.d.	t.b.d.
Fc	Chest freezer [3]	t.b.d.	t.b.d.
	Built-in		
Rb	At least one unfrozen compartment [1] and optionally one or more other compartments from the types unfrozen, one-star or two-star.	t.b.d.	t.b.d.
RFb	At least one unfrozen compartment and at least one freezer [2] compartment	t.b.d.	t.b.d.
Wb	Wine storage appliance	t.b.d.	t.b.d.
Fub	Upright freezer [3]	t.b.d.	t.b.d.
Compensations (all on reference line)			
FF	Frost-free compensation	FF_c (t.b.d)	
CH	Chill compartment compensation (for volumes > 15 dm3)	*C* (t.b.d.)	
MD	Multi-door compensation ($n_d \geq 3$ doors)	*D* (t.b.d)	
Formula's			
V_{eq}	Equivalent (or adjusted) volume $V_{eq} = \sum_{c=1}^{c=n} V_c \times \frac{T_k - T_c}{T_k - 4}$; T_k = interpolated ambient temperature		
SAE	Standard energy consumption $SAE_c = \{[M + M_D]V_{eq} + N + M_{CH}V_{chill} + N_{CH}\}(1 + FF_c \times FF_{ratio})$		
Notes			
1)	According IEC62552-1:2015: any of the following compartment types: zero-star, chill, fresh food, cellar, wine storage or pantry		
2)	According IEC62552-1:2015: a freezer compartment can be a four star or a three star compartment		
3)	Two star compartments or sections inside the freezer are allowed		



Better distribution compared to actual categories

Motivation category ***R***

- 1, 2 and 3 already have the same reference line
- Basis is one or two unfrozen compartments. If extended to more, also category 10 products with multiple compartments are included in ***R***
- Integrate 4 and 5 by adding frozen compartments * and **
- Covers also new pantry compartment



Motivation category ***RF***

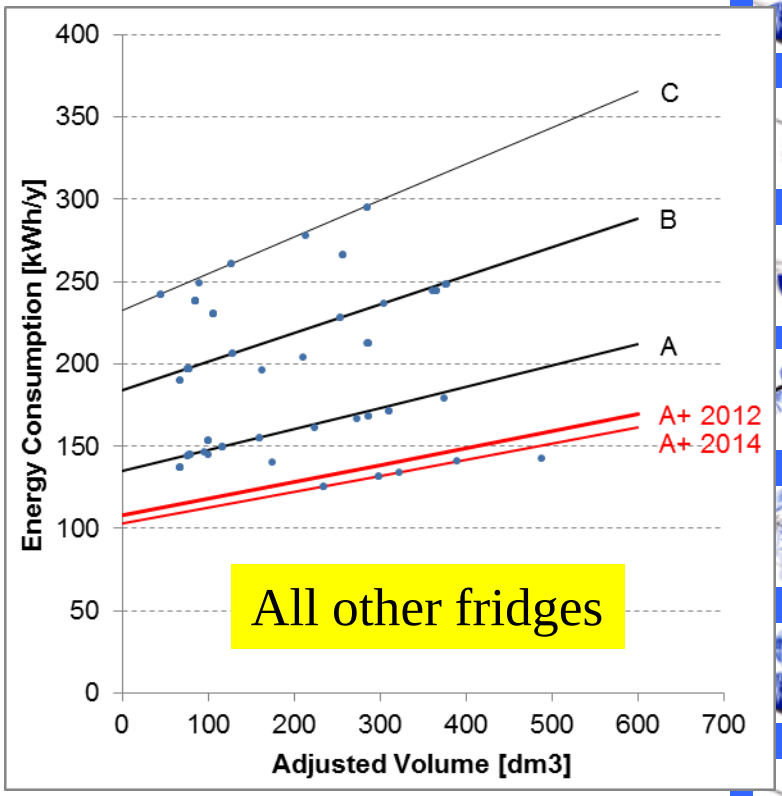
- 6,7 already have the same reference line
- Use the new definition of **freezer** according IEC62552-1:2015: can be *** or (*)***
- Currently only one fresh food and one frozen food (*)***. If extended to more, category 10 products with multiple compartments are included in ***RF***

Issues:

- Impact of new global standard depending on type I or type II

Motivation category *W*

- Keeping wine storage appliances with fridges in the same category limits seriously the rescaling options →
- Glass doors must be taken into account



Motivation category ***Fu, Fc***

- Just changed from numbers to letters (***Fu*** = upright, ***Fc*** = chest)
- Keep products in separate categories as these are quite distinct

Motivation built-in ***b***

- Tested under different circumstances than free standing -> higher rated consumption at equal internal volume
- Exposing a free standing product to “built-in” conditions increases consumption
- -> No fair comparison possible (even with correction)
- Incorrect usage easy to detect with separate categories instead of “hidden” correction factor.
- “≤ 58 cm” rule:
  - Was introduced to avoid loop holes
  - Covers the most important part of the market
  - No technical justification
  - Proposed to close the loop hole (as alternative) by strong definition:

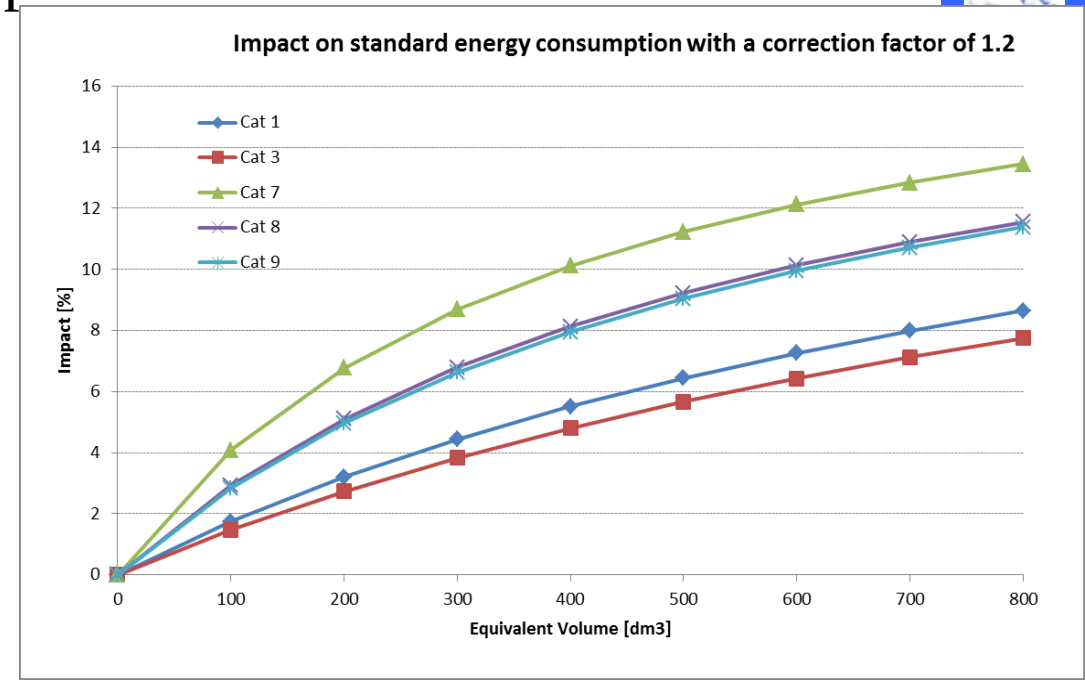
Built-in appliance:
Any appliance that is designed, intended, tested and marketed exclusively
(1) to be installed totally encased (top, bottom, sides and back) by cabinetry or panels that are attached during installation,
(2) to be securely fastened to the sides, top or floor of the cabinetry and
(3) to either be equipped with an integral factory-finished face or accept a custom front panel.

Motivation *FF* compensation

- Compensates for additional energy use of frost free feature
- Only applies to frozen food compartments
- Today a correction factor on volume which does not allow a fair treatment of large/small appliances
- Alternative: frost free compensation:

$$SAE_c = (V_{eq}M + N) \times (1 + FF_c \times FF_{ratio})$$

- FF_{ratio} is needed for combi-products
- FF_c = 1.1 gives on average same effect on data base as volume correction factor 1.2



Motivation *CH* compensation

- Refrigerators/freezers with chill compartment use additional energy not compensated by the thermodynamic factor
  - Due to very tight temperature tolerances
  - Volume reduction, due to ducting etc.
- Chill offers significant advantages for food preservation not recognized in the label
- The current bonus is not sufficient to cover the incremental energy and volume loss:
- Propose a volume dependent compensation:

$$SAE_c = MV_{eq} + N + M_{CH}V_{chill} + N_{CH}$$

- Practical approach: M_{CH} and N_{CH} selected to have slightly less compensation then today at 15 liter and app. the double at 100 liter

Motivation compensation *MD*

- Products with multiple door offer a different service.
- Better food preservation possible (e.g. in cellar compartments) which can reduce energy use at the same time
- Less influence of door openings
- Proposed compensations:

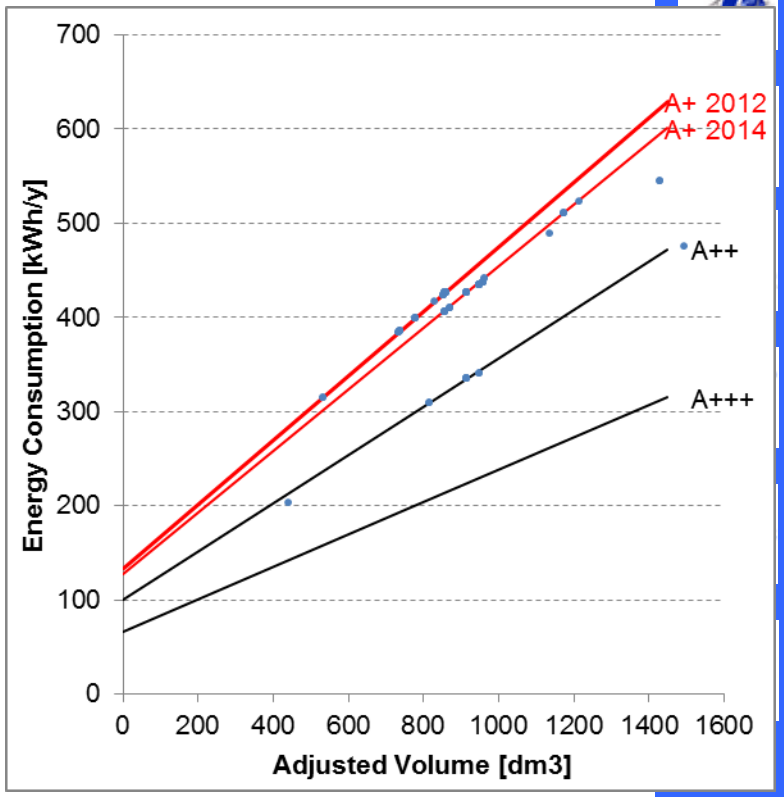
$$SAE = [M + M_D]V_{eq} + N$$

$$M_D = 0.00 \quad n_d \leq 2$$

$$M_D = 0.03 \quad n_d = 3$$

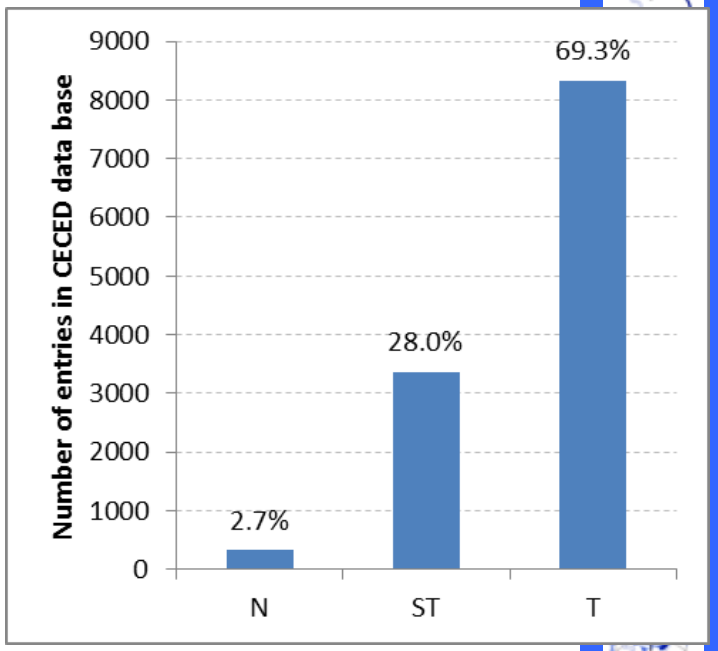
$$M_D = 0.05 \quad n_d = 4$$

$$M_D = 0.06 \quad n_d \geq 5$$



Climate class correction

- Today a correction factor on volume
- Does not allow a fair treatment of large/small appliances or between categories
- Has become only an issue for ST versus T (so max 10 % difference on volume)
- However, eliminating correction factor: +5 to 10 % on consumption -> needs compensation by reference lines adjustments



Data analysis

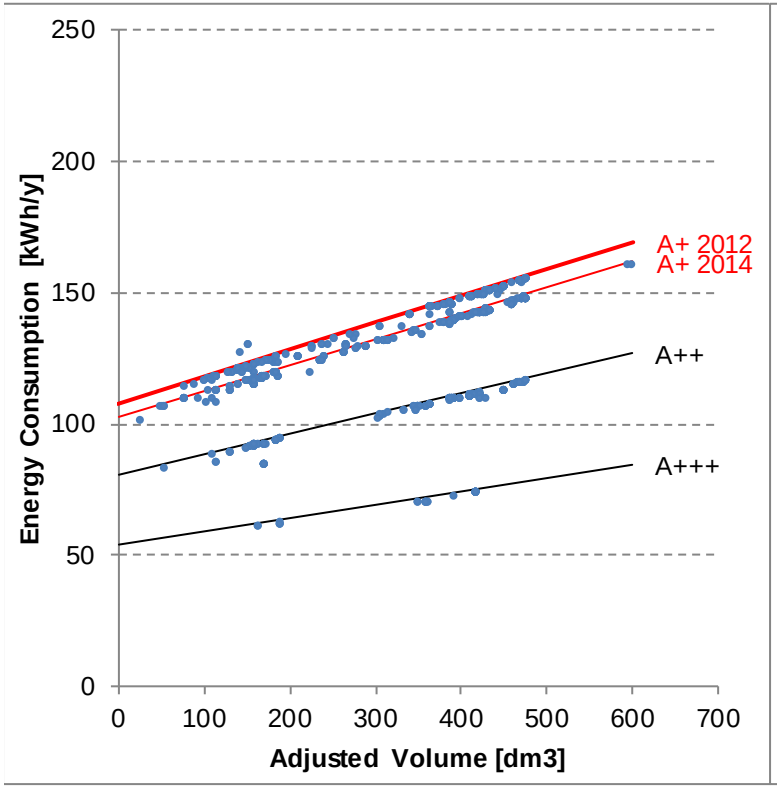
Generic approach:

- Use CECED database 2013 as reference and for each product:
  - Change energy consumption due to new global standard
  - Do not change volume and calculate equivalent volume
  - Remove all correction factors on volume
  - Correct energy consumption with the compensations (this allows plotting all data points in one chart)
- Plot all data in a volume – corrected energy consumption chart
- Add a "transposed" MEPS line corresponding to the 2012 A+ limit.
- A few examples shown, rest in report

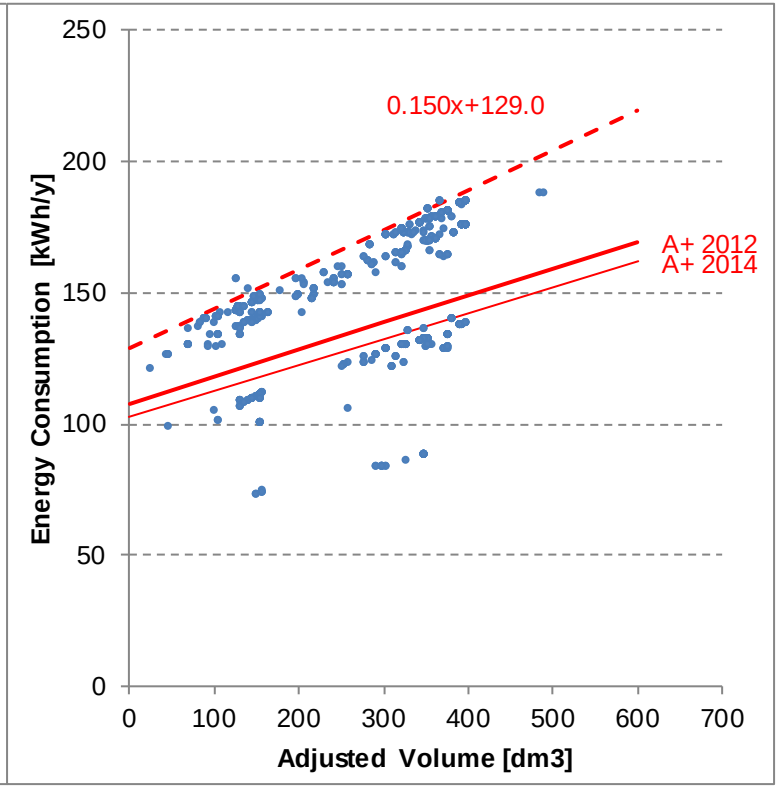
Data analysis cat ***R***

Category	**R**	Energy increase due to standard	19 %	
No of products	920	Elimination of climate class correction factor		
		Chill compensation M and N	0.25	15

Present situation



New situation



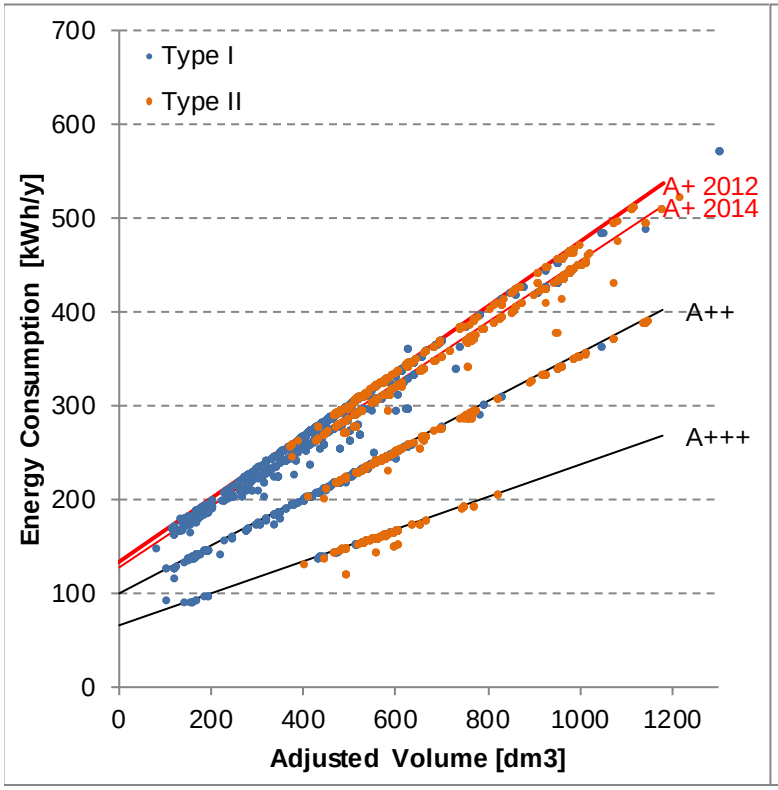
Data analysis cat ***RF***

Average frost free and static

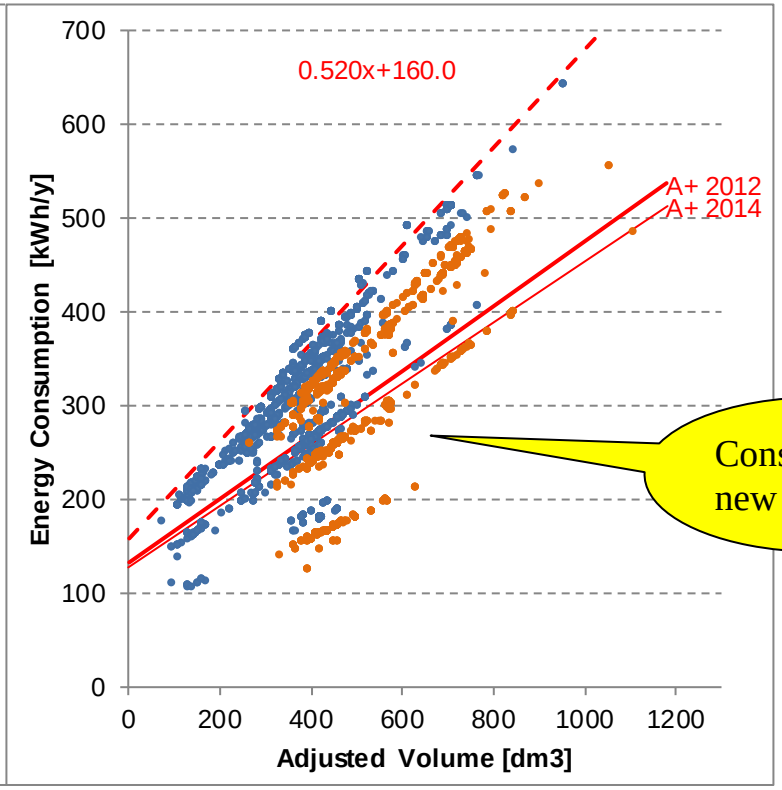
Category	RF
No of products, Type I	3269
No of products, Type II	2220

Energy increase due to standard type I (%)	19	
Energy increase due to standard type II (%)	8	
Frost free compensation (%)	10	
Chill compensation M and N	0.25	15
Elimination of climate class correction factor		
Elimination of frost free correction factor		

Present situation



New situation



Consequence new standard

Concluding remarks 1

- Revision of Ecodesign and EL measures offer an opportunity for further changes
- Integral approach presented to deal with:
  1. New global standard -> Changes the basis, experimental data supplied
  2. Product categorization update -> Reflect changes in the market. Separate categories for built-in.
  3. Climate class correction factor -> Removed

     Correction factors -> Replaced by compensations on the reference line (except for the thermodynamic factor) due to bias to category and appliance size.

Concluding remarks 2

- All proposals, impact study and other data has been submitted to the commission study carried out by VHK
- CECED expects this data to be taken into account for the revision of Ecodesign and Energy Labelling measures

- Many thanks for the opportunity to share this information