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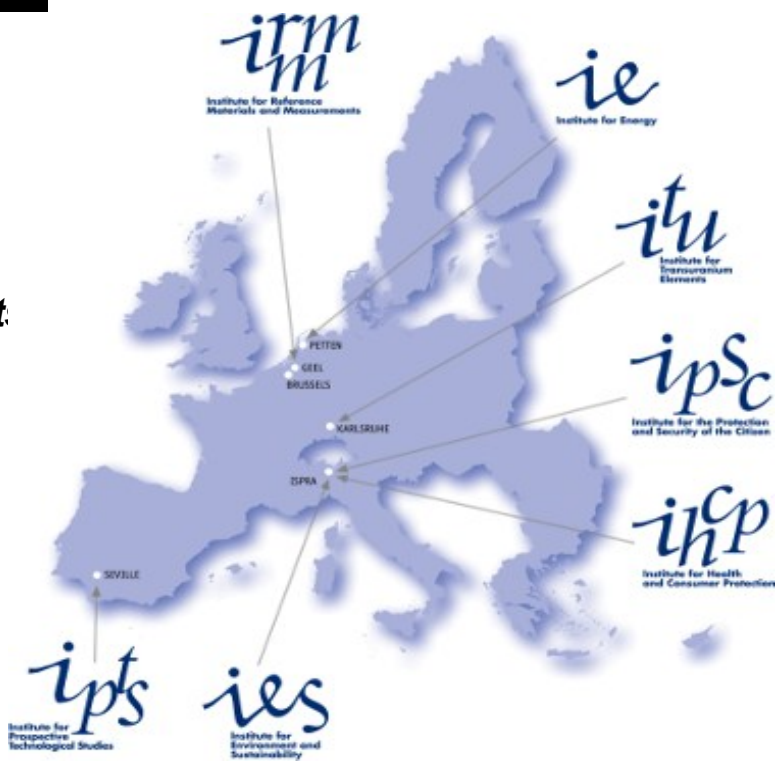
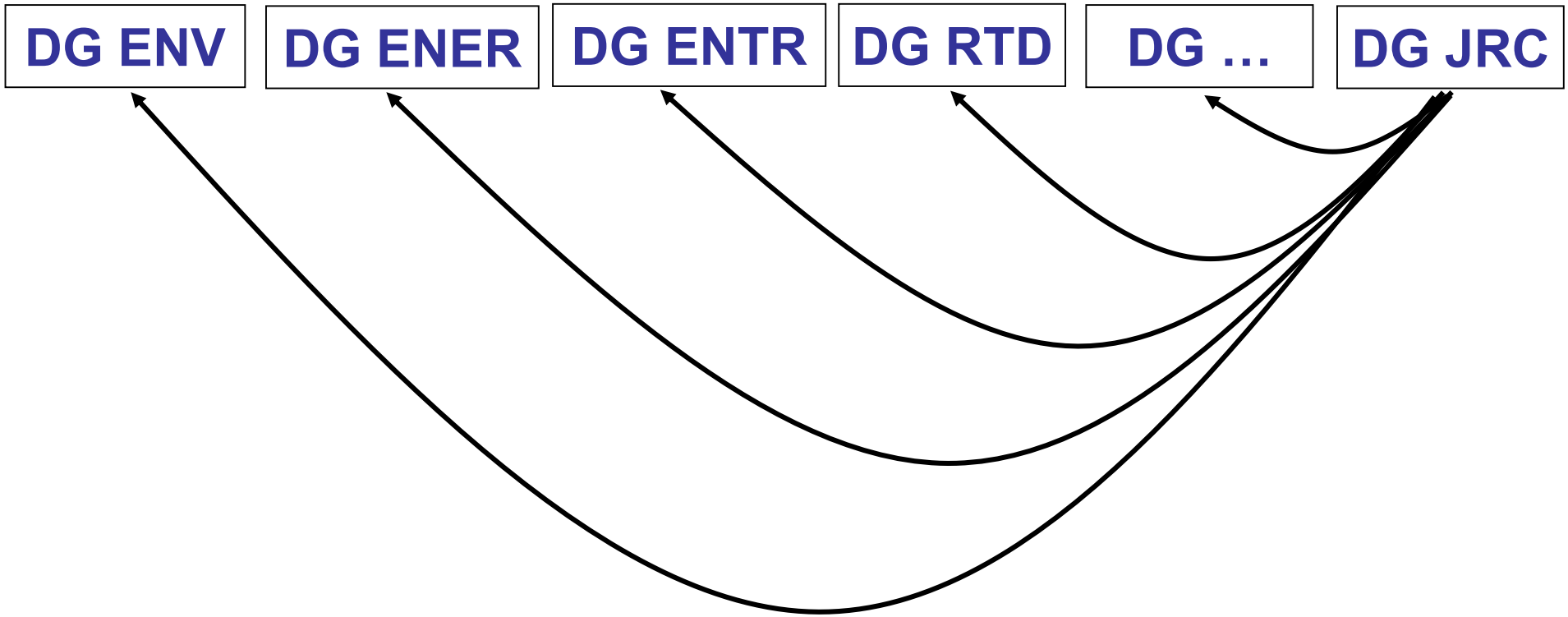
Institute for Prospective Technological Studies



Joint Research Centre in the context of the European Commission:



Activities in support of Product Policy

IPTS supports the **development and implementation of environmental product policies**, amongst them the EU Ecolabel Regulation, the Green Public Procurement Communication, the **Energy Related Products Directive and the Energy Labelling Directive**.

This includes the **techno-economic research** as well as the operational management particularly of the **stakeholder consultation.**

Thank you

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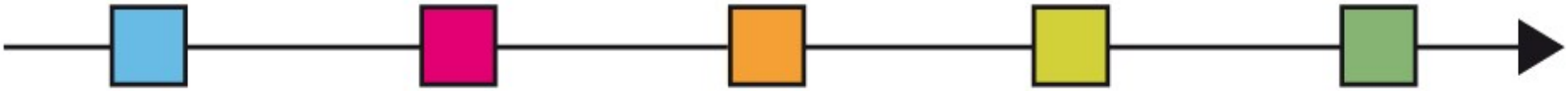
Ecodesign for Commercial Refrigeration ENER LOT 12

Hans Moons (JRC-IPTS)
Alejandro Villanueva (JRC-IPTS)
Oliver Wolf (JRC-IPTS)

Ewout Deurwaarder (DG Energy)

Introduction

Ecodesign process



Product study completed

A study for each product group examines market data, technological status and other relevant issues.

When the study is completed, the Commission formulates a proposal (working document) taking the findings and recommendations of the study into account.

Consultation forum and proposal

The proposal (working document) from the Commission is communicated to experts, stakeholders and Member States. These parties meet in the Eco-design Consultation Forum to discuss the proposal.

Based on the Consultation Forum and the impact assessments, the Commission formulates a draft regulation.

Draft regulation

When the Commission has formulated a draft regulation, it is submitted to the Eco-design Regulatory Committee, which is composed by one representative from each EU Member State.

Regulatory committee

After the proposed regulation is adopted by a majority of the Regulatory Committee (the voting power of each Member State is weighted based largely on each state's population) it is sent to the European Parliament for scrutiny. It is also notified to the World Trade Organisation.

Final regulation

The regulation is formally adopted by the Commission and published in the Official Journal of the European Union (OJ) before it enters into force.

The most likely legal form of the implementation is "regulation", which means that it takes direct legal effect in all Member States.

Where we come from…

- History of the project
- 1st meeting 23 April 2013
- Specific Questionnaires on:
  - Scope and definition (May 2013)
  - Energy formulas (Sept 2013)
- Direct stakeholder contacts and Back2Back meetings:
  - Associations (Eurovent, EVA, CLASP)
  - Retailers (Carrefour, El Corte Ingles, Alcampo/Auchan, Migros, Dia, Walmart, Delhaize, AH, …)
  - Industry (Norpe, Red Bull, Heineken, Coca-Cola, Unilever, Honeywell, …)
  - Plant visits: Manufacturers (Bonnet-Névé, Koxka, Efficold) and EoL (Recilec, FCC ambito, ...)
  - Test labs (Cemafroid, RD&T, Re/Gent)

Where we are now…

Basis for today is **working document (Version 2)** distributed 12 November 2013

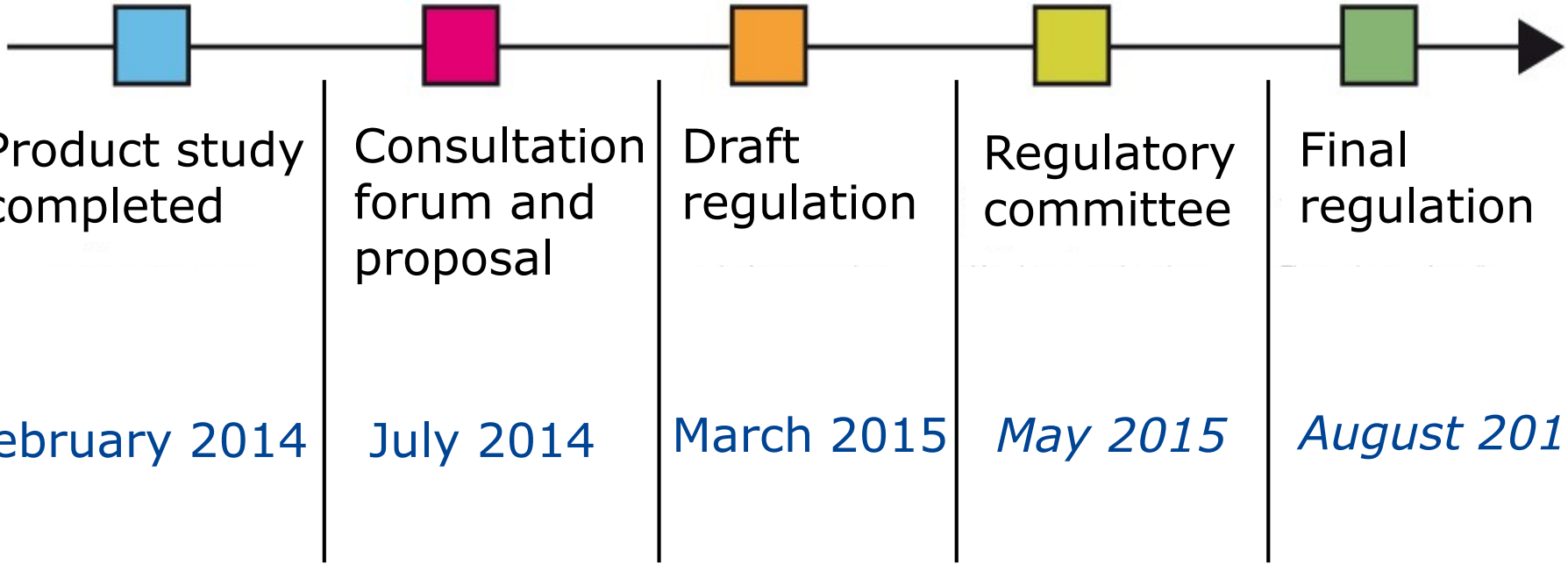
- Update of version 1
- Includes input from retail sector, obtained through a phone interview campaign (September-November 2013)
- Revamped section on EoL
- New section on energy use with new, up-to-date, data sets (> 2500 data points)

Where are we going to…

- Collect written feedback: **until 20 January 2014**
- No more technical working group meetings…
- …but the contact with the stakeholders will not be interrupted, and will be intensified for the Impact Assessment

- Final technical report: end February 2014
- Commission Working Document: June 2014
- Consultation Forum: July 2014
- Impact Assessment: February 2015
- Final Regulation: *August 2015*
- Adopted Regulation: *December 2015*

Where are we going to…



Introduction

Aim of today's meeting:

- Present status of knowledge
- Last TWG to discuss with stakeholders final data gaps and where to find the data
- Try to find consensus

How?

- Refresh info in background document (questions, comments)
- Discuss key issues
- Task-by-task, followed by wrap-up

Thank you

Scope and definition

Definition

A commercial refrigerated cabinet is a

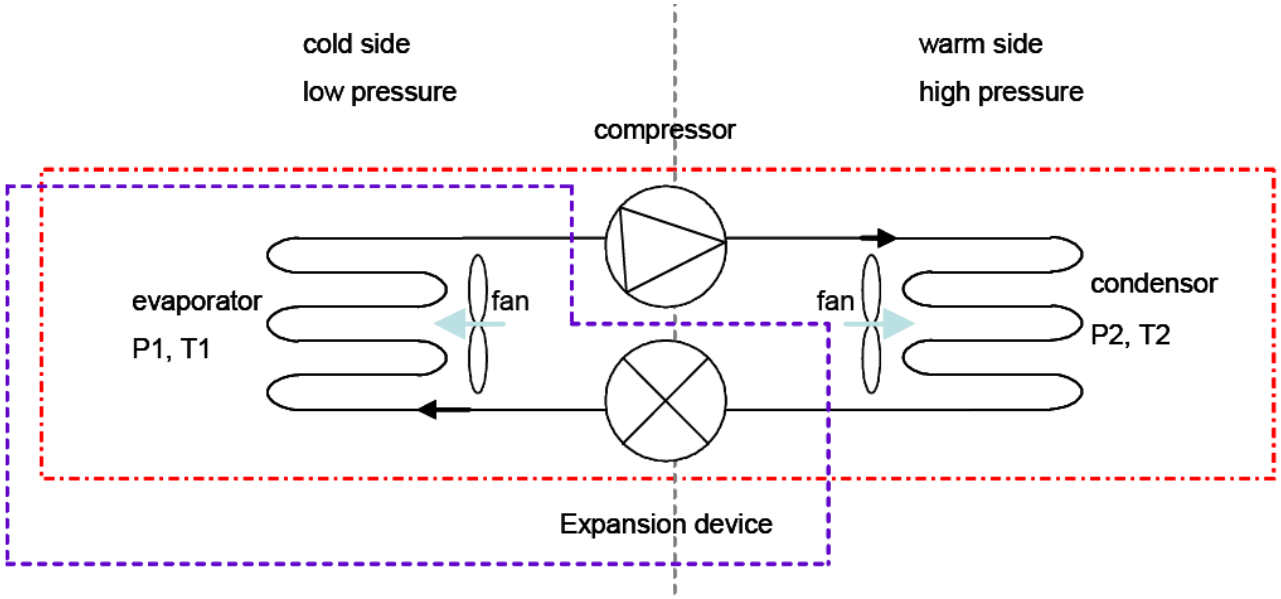
- refrigerated appliance
- intended for the storage **and** display for merchandising
- at specified temperatures below the ambient temperature, of chilled and/or frozen products[1]
- accessible directly through open sides or via one or more doors, and/or drawers
- designed for the use by commercial, institutional or industrial facilities

[1] **Typically food and drinks, but also other perishable goods like flowers, or live bait where refrigeration is used to extend the lifetime.**

Scope and definition

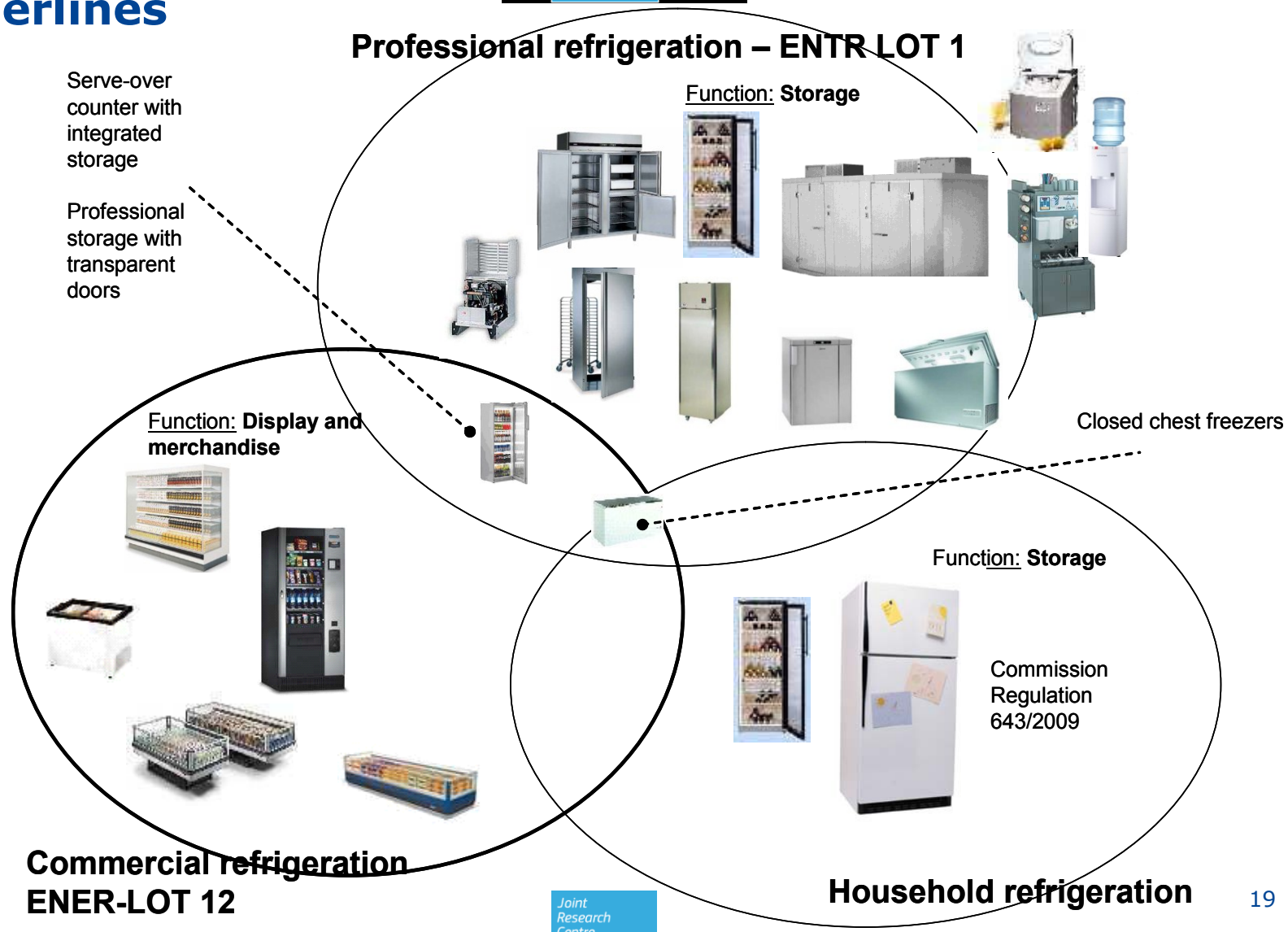
- Plug-in **display cabinets**

- Remote **display cabinets**: remote cooling system (compressor and condensor) is **NOT** taken into account



Scope and definition

Borderlines



Included in Commercial Refrigeration, LOT 12:

- Supermarket segment
- Serve-over/self-service counters (with integrated storage)
- Merchandising (small) ice-cream freezers
- Beverage coolers (non-perishable foodstuff)
- Gelato ice-cream display cabinets
- Vending machines

Excluded from Commercial Refrigeration, LOT 12 :

- Walk-in cold rooms
- Water dispensers
- Ice(-cream) makers
- Minibars
- Wine coolers
- Professional service cabinets
- Storage for medicines or scientific purposes
- Vending machines combined with heating/food preparation

Questions

- Do you agree with the definition of commercial refrigeration proposed above?

- Do you agree with the scope proposed above? Are there any appliances that in your view should be included/excluded?

- Niche applications included/excluded?
  - *e.g.* salad bars
  - *e.g.* sub-zero coolers (really niche?)

Thank you

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Standards and legislation

Legislation

Domain	LEGISLATION
Environment	
Entire product	Waste Electrical and Electronic Equipment Directive 2012/19/EU
	Restriction of the use of certain Hazardous Substances in electric and electronic equipment Directive 2011/65/EC
Refrigerating Fluids	Ozone Depleting Substances Regulation 1005/2009
	Fluorinated Greenhouse Gases Regulation 842/2006 (update in progress)
Shipment as waste	Waste Shipment Regulation 1013/2006
Energy	
Lighting	Energy efficiency requirements for ballasts for fluorescent lighting-Directive 2000/55/EC
Safety	
Entire product	Machinery Directive 95/16/EC
	General Product Safety Directive 2001/95/EC
	Low Voltage Equipment Directive 73/23/EEC
	Equipment and protective systems intended for use in potentially explosive atmospheres Directive 94/9/EC (ATEX)
	Pressure Equipment Directive 97/23/CE

Legislation

- F-gas regulation, update
- Safety regulations, ATEX and Pressure Equipment Directive
- End-of-Life: WEEE, Waste Shipment Regulation

WEEE DIRECTIVE 2012/19/EU

15 August 2018: temperature exchange equipment

- Proper treatment
  - removal of all fluids and a selective treatment,
  - chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC),
  - printed circuit board is greater than 10 square centimetres,
  - external electric cables,

WEEE DIRECTIVE 2012/19/EU

- Proper treatment
  - mercury containing components, such as switches or backlighting lamps,
  - equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in **foams** and refrigeration circuits: the gases must be properly extracted and properly treated

Relevant standards for Lot 12 products

TYPE	STANDARD
International Standards	
Safety	ISO 5149:1993(2004): Mechanical refrigerating systems used for cooling and heating − safety requirements
	IEC 60335:2012 part 2-75: Household and similar electrical appliances − safety −: Particular requirements for commercial dispensing appliances and vending machines − part 2-89: particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor
Energy use	ISO 23953-2:2005/Amd 1:2012 refrigerated display cabinet − part 2: classification, requirements and test conditions
European Standards	
Safety	EN378 1:2008+A2:2012: Refrigerating systems and heat pumps – Safety and environmental requirements

Standards

- ISO 23953-A1:2012, update
- Standard for gelato ice-cream freezers under development by CENELEC
- EVA-EMP currently under revision by CENELEC
- Labelling with identification of foam gases in household (and some commercial) refrigeration

Questions

- Labelling of foam gases regulated or voluntary?
- Status of hydrocarbons in vending machines, *e.g.* USA?
- Volume measurement will be removed from ISO 23953 standard?

Thank you

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Markets

Why are market data needed?

- In this preparatory phase, only generic figures (stocks, annual production) have been collected in order to check the market shares of product groups, enabling prioritisation of detailed data collection efforts

- The next phase of the project (2014-15) includes an Impact Assessment, where more detailed market data will be requested from all product groups within the scope

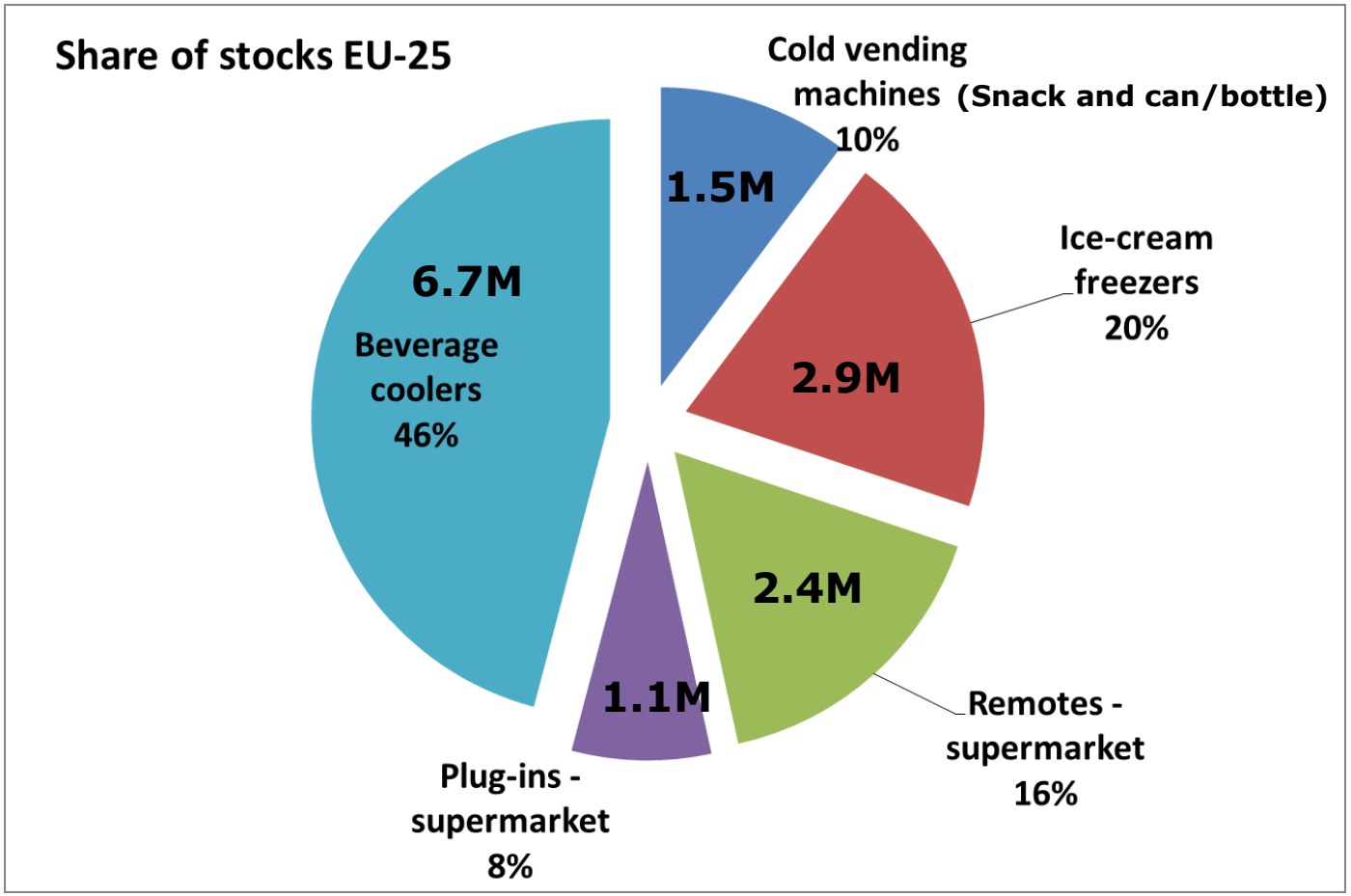
PRODCOM classifications used in Eurostat

Description	HS/CN reference
Refrigerated show-cases and counters incorporating a refrigerating unit or evaporator for frozen food storage	8418 50 11
Refrigerated show-cases and counters incorporating a refrigerating unit or evaporator (excluding for frozen food storage)	8418 50 19
Deep-freezing refrigerating furniture (excluding chest freezers of a capacity ≤ 800 litres, upright freezers of a capacity ≤ 900 litres)	8418.50.91
Refrigerating furniture (excluding for deep-freezing, show-cases and counters incorporating a refrigerating unit or evaporator)	8418.50.99
Automatic goods-vending machines incorporating heating or refrigerating devices	8476[.21 + .81]

Breakdown level is not detailed enough

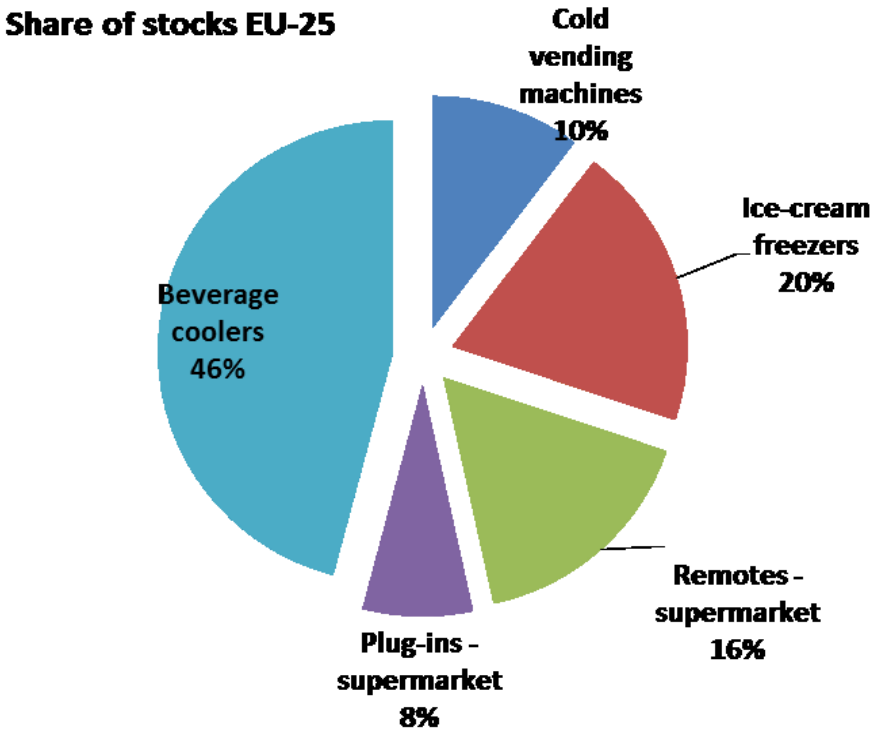
⇒ Generic market data has been collected directly from industry associations

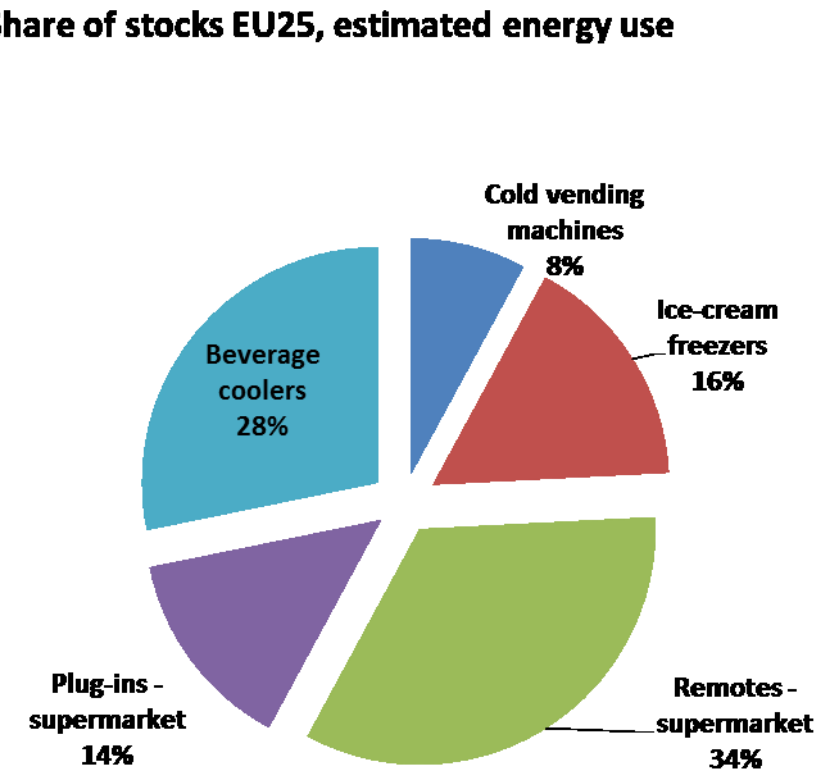
Stock estimates (EU, 2010, in total units)



Sources: EVA, BIO IS

Shares by units vs. shares by energy use





Stock estimates: breakdown

- **Supermarket segment**: For horizontals no breakdown for freezer versus refrigerator

Remote

Table 1 Detailed estimates of sales figures for 2010 for remote supermarket cabinet, per cabinet type. Source: Eurovent, 2010.

Cabinet type, ISO 23953	Temp. Class	Weight %	Sales EU	% Family	Sales/Family
RVC1, RVC2	3H	0,61	111.976	0,10	11.198
	3M2	0,61		0,50	55.988
	3M1	0,61		0,15	16.796
	3M0	0,61		0,10	11.198
RVC3	3H	0,61		0,05	5.599
	3M2	0,61		0,10	11.198
RVF1	3L3	0,04	7.343	0,05	367
RVF4	3L1	0,04		0,35	2.570
RVC4	3H	0,04		--	--
	3M2	0,04		0,10	734
	3M1	0,04		0,30	2.203
	3M0	0,04		0,20	1.469
RHC1	3H	0,16	29.371	--	--
	3M2	0,16		0,60	17.623
	3M1	0,16		0,40	11.748
RHF1	3L3	0,13	23.864	0,02	477
RHC3, RHC4	3M2	0,13		0,15	3.580
	3M1	0,13		0,15	3.580
	3M0	0,13		0,05	1.193
RHF3, RHF4	3L1	0,13		0,02	477
	3L2	0,13		0,08	1.909
	3L3	0,13		0,20	4.773
RHC5, RHC6	3H	0,13		--	--
	3M2	0,13		0,04	955
	3M1	0,13		0,08	1.909
RHF5, RHF6	3L1	0,13		0,10	2.386
	3L2	0,13		0,08	1.909
	3L3	0,13		0,03	716
RYF3	3L2	0,06	11.014	0,35	3.855
	3L3	0,06		0,35	3.855
RYF4	3L2	0,06		0,15	1.652
	3L3	0,06		0,15	1.652
		Tot. EU 27 2010	183.568		

Plug-in

Table 1 Detailed sales estimates for 2010 per cabinet type for plug-in display cabinets of the supermarket segment. Source: Eurovent, 2010.

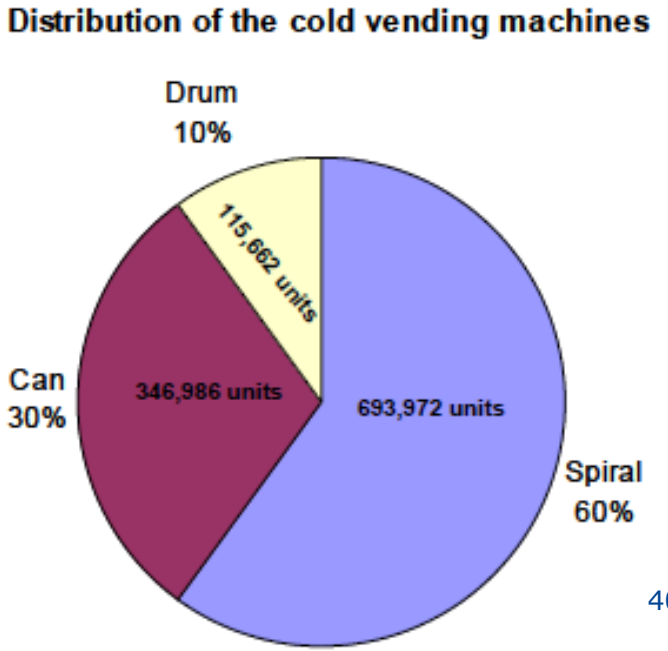
Cabinet type, ISO 23953	Temp Class	Weight %	Sales EU	% Family	Sales/Family
IVC1, IVC2	3H	0,61	103.815	0,35	36.335
	3M2	0,61		0,35	36.335
	3M1	0,61		0,1	10.381
	3M0	0,61		0,05	5.191
IVC3	3H	0,61		0,1	10.381
	3M2	0,61		0,05	5.191
IVF1	3L3	0,04	6.808	--	--
IVF4	3L1	0,04		0,35	2.383
IVC4	3H	0,04		0,1	681
	3M2	0,04		0,2	1.362
	3M1	0,04		0,3	2.042
	3M0	0,04		0,05	340
IHC1	3H	0,16	27.230	0,15	4.085
	3M2	0,16		0,6	16.338
	3M1	0,16		0,25	6.808
IHF1	3L3	0,13	22.124	0,02	442
IHC3, IHC4	3H	0,13		0,15	3.319
	3M2	0,13		0,15	3.319
	3M1	0,13		0,05	1.106
IHF3, IHF4	3L1	0,13		0,02	442
	3L2	0,13		0,08	1.770
	3L3	0,13		0,2	4.425
IHC5, IHC6	3H	0,13		--	--
	3M2	0,13		0,04	885
	3M1	0,13		0,08	1.770
IHF5, IHF6	3L1	0,13		0,1	2.212
	3L2	0,13		0,08	1.770
	3L3	0,13		0,03	664
IYF3	3L2	0,06	10.211	0,35	3.574
	3L3	0,06		0,35	3.574
IYF4	3L2	0,06		0,15	1.532
	3L3	0,06		0,15	1.532
		Tot. EU 27 2010	170.188		

Stock estimates: breakdown

- **Beverage coolers (6.7M):** BIO IS: 10 % of the beverage cooler stock are open, and 90 % with doors. No data yet of market for sub-zero coolers.

- **Vending machines (1.5M):** BIO IS, 2006

	Total VM stock	
	2010	**2011**
Total market vending machines	3 786 572	3 778 026
Cold machines		693 986 (18%)
Snack machines		799 982 (21%)



Stock estimates

No data:

- Ice-cream freezers
- Gelato freezers (only 2012 sales data)

Prospective estimates / past datasets:

- Some data reported or available already
- Data/estimates will be needed for all categories

Remote display cabinets

	EU-25 STOCK
2004	2 032 959
2005	2 082 600
2006	2 151 654
2007	2 207 295
2008	2 266 642
2009	2 325 849
2010	2 385 055

Plug-ins, supermarket segment

	EU-25 STOCK
2004	720 000
2005	770 000
2006	825 000
2007	882 500
2008	945 000
2009	1 010 000
2010	1 080 000

Table 1 Past and predicted UK market growth rate for cold vending machines. Source: UK Market Transformation Program, 2009.

Year	2000	2002	2006	2008	2010	2016	2020	2025	2030
Assumed market growth rate	1%	0%	-4%	-2%	0%	2%	2%	2%	2%

Next steps (2014-15)**:**

- Working document for the Consultation Forum (June 2014)
- Impact Assessment

Market data needs (2014-15)**:**

• Working Document:
⇒ Refinement of existing data, abstract of first draft of the IA

• Impact Assessment
⇒ Detailed market data will be requested from all product groups within the scope

Impact Assessment

Specific data needs will be (1):

- Confirmation/correction of the proposed characterisation of energy savings of technologies
- Estimated population of appliances in each category for which there is a formula: (1) Current picture, (2) Future picture(s) in the likely adoption, and sunset date(s)
- Average purchase price per product group
- Average appliance life-cycle costs
- Sector turnover (manufacture, retail, wholesale, recycling)
- Employment (within/outside the EU)

Impact Assessment

Specific data needs will be (2):

- Trade data (to estimate the impact of EU vs. non-EU industry)
- Historic sales data, needed for projections of sales to 2020-2025
- Estimated competitive benefits, and costs of discontinuing production of the non-compliant appliances
- Additional data that may be used to estimate rebound effects, apart from energy and savings expenditure.
- EoL data: % appliance collection/reuse/refurbishment/ recycling

Markets

- We will be back in contact with the TWG members in 2014 to request additional data, via questionnaires and bilateral meetings.
- It is in mutual benefit that we can assess beforehand, with the highest precision possible, the potential effects to the affected industry, in order to maximise competitiveness potentials and avoid negative impacts.
- Misjudgement due to insufficient information may result for larger actual costs for industry.

Thank you

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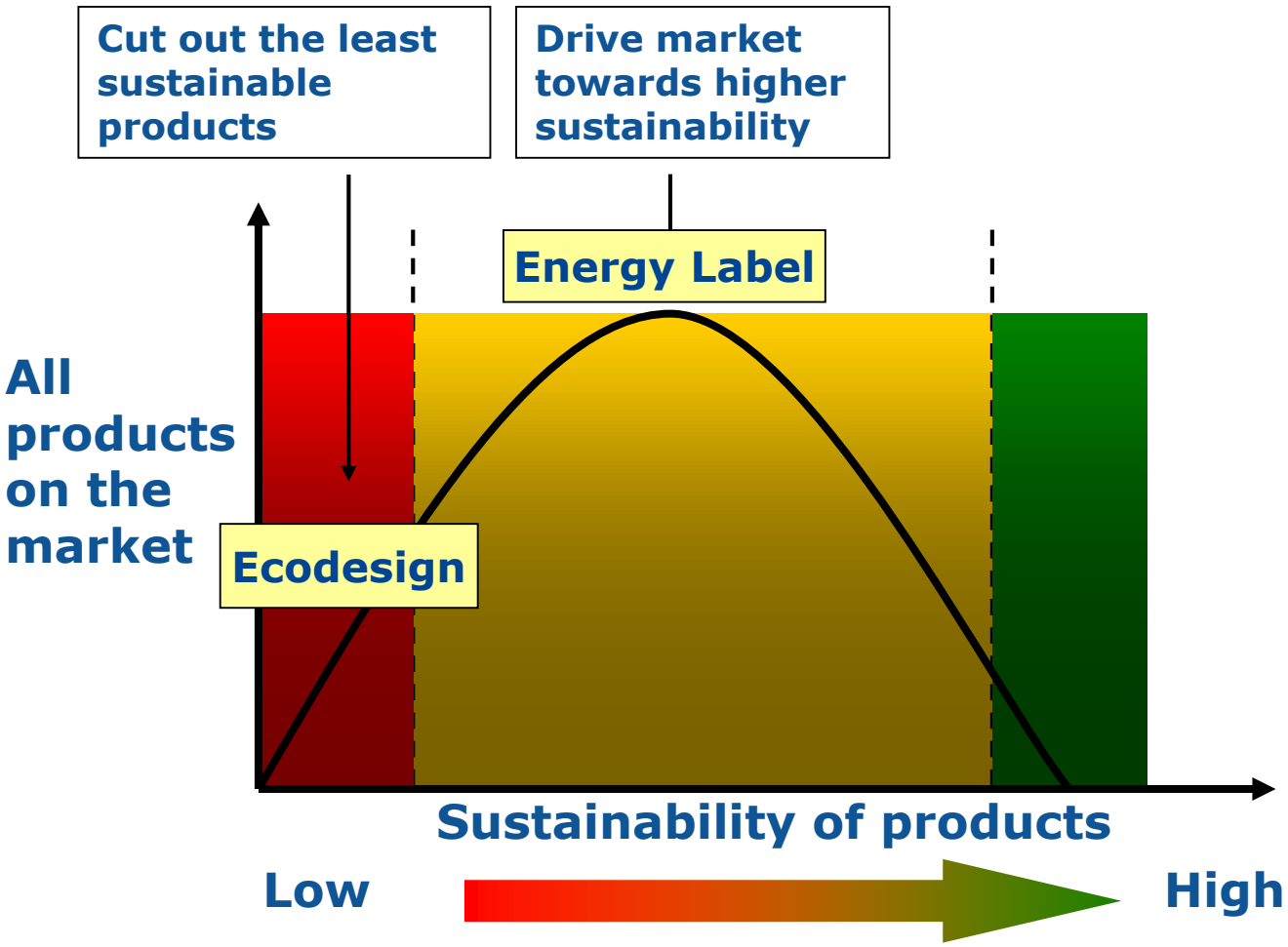
Technologies – Environment – Design

Energy


Cut out the least sustainable products
Drive market towards higher sustainability
Energy Label
All products on the market
Ecodesign
Sustainability of products
Low
High

Energy consumption

Define energy consumption

⇩

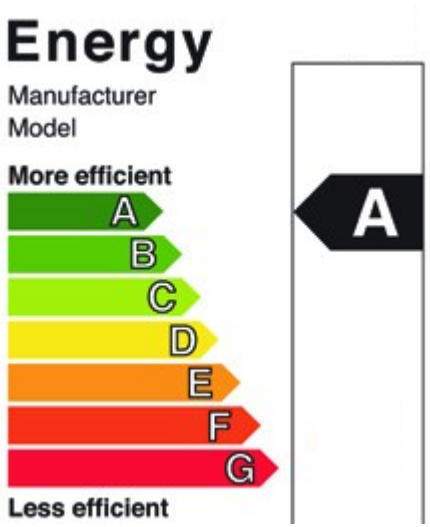
Discard the worst performing products from the EU market

Energy Efficiency Index (EEI)

EEI = (energy consumption / reference)

Measured, standard

To be defined



Generic structure of the refrence energy consumption formula

$$TEC = C_1 + C_2 * X$$

- **TEC** is the Total Energy Consumption, measured in kWh/day
- **X** is either TDA (Total Display Area, measured in m^2) or V (net refrigerated volume, measured in litres) depending on the functionality
- **C_1** is an offset constant in kWh/day
- **C_2** is a constant multiplier in kWh/(day.m^2) or kWh/(day.litre)

In the next slides we present the following issues, followed by questions:

- Segmentation rationale
- Formulas proposed for each subgroup

Segmentation

- Supermarket segment
- Beverage coolers
- Small ice-cream freezers (V < 500 litre, TDA < 1.1m²)
- Gelato ice-cream freezers
- Vending machines

Supermarket segment

Supermarket segment

Current segmentation

- Working temperature (L1, M2, H1,…); refrigerator *vs.* freezer
- Geometry: horizontal *vs. v*ertical/semi-vertical
- open *vs.* closed: reference data freezers only based on closed appliances
- per cabinet classification (VC1, VC2, …, HC1, YF4, …): too detailed segmentation
- plug-in *vs.* remote: no conclusive scientific evidence

Supermarket segment

- **Data set**
  - Eurovent, 2549 datapoints used, 2013 market
  - ISO 23953-A1:2012 tested or estimated
  - ISO 23953 run-method for remote appliances
  - Non sales weighted

Supermarket segment

- **Data set and proposed fromuals**

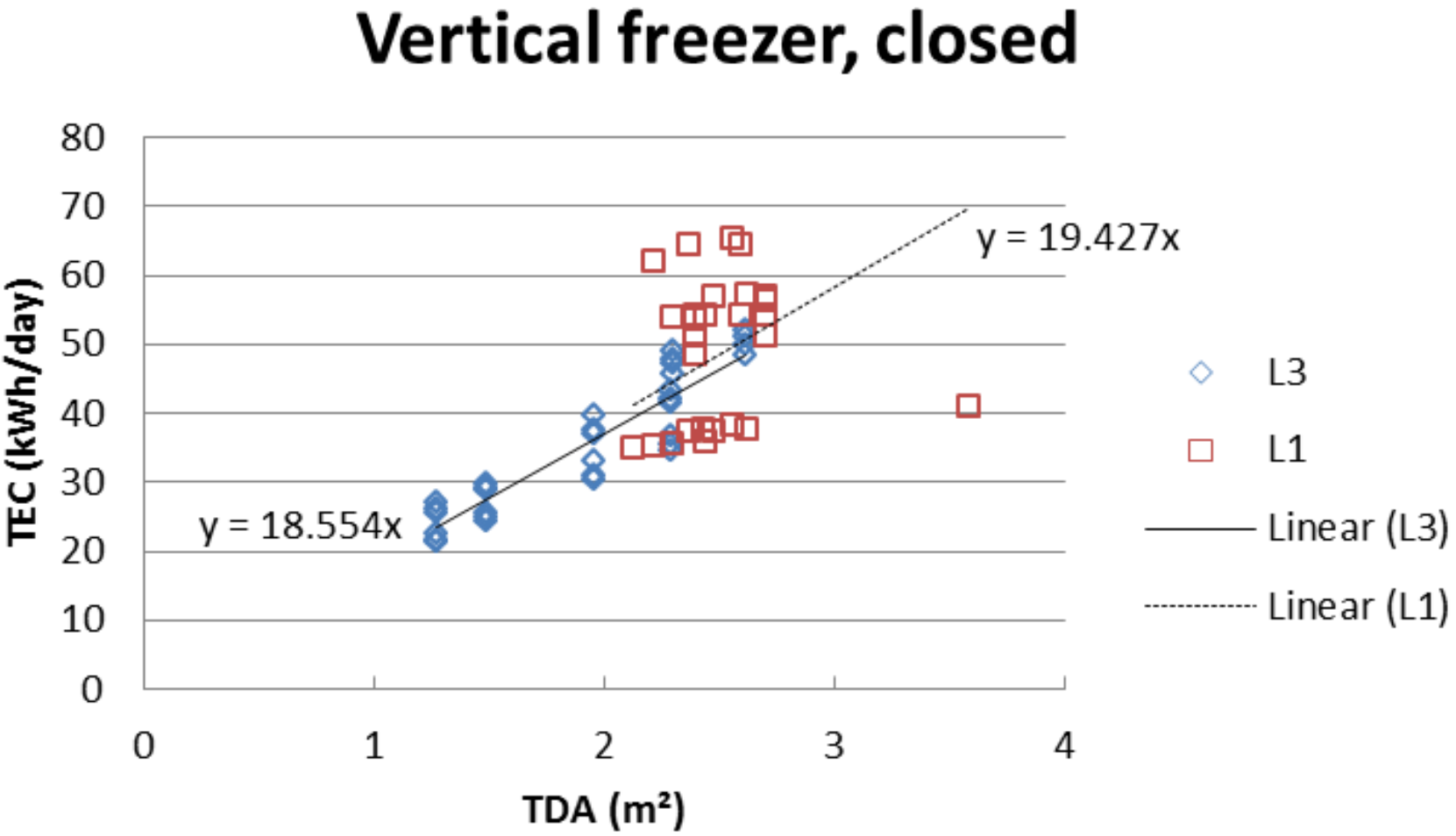
		Product temperature	TEC kWh/day	C_2 kWh/(day.m²)	TDA m²	Datapoints
Freezers	Vertical/combined (based on data from YF4, VF4, YM6)	L1	TEC =	**19.4**	TDA	27 (26R, 1PI)
		L2	TEC =	**no data**	TDA	0
		L3	TEC =	**18.5**	TDA	32 (20R, 12PI)
	Horizontal (based on data from HF5, HF6)	L1	TEC =	**9.8**	TDA	24 (0R, 24PI)
		L2	TEC =	**9.0**	TDA	4 (3R, 1PI)
		L3	TEC =	**7.4**	TDA	7 (7R, 0PI)
Refrigerators	Vertical/combined (based on data from VC1, VC2, VC3, VC4, YC4)	M1/M0	TEC =	**12.3**	TDA	922 (898R, 24PI)
		M2	TEC =	**10.6**	TDA	1206 (1121R, 85PI)
		H	TEC =	**7.6**	TDA	167 (162R, 5PI)
	Horizontal (based on data from HC1, HC2, HC3, HC6, HC7)	M1/M0	TEC =	**5.4**	TDA	50 (28R, 22PI)
		M2	TEC =	**5.3**	TDA	91 (91R, 0PI)
		H	TEC =	**4.6**	TDA	19 (9R, 10PI)

R: remote, PI: plug-in

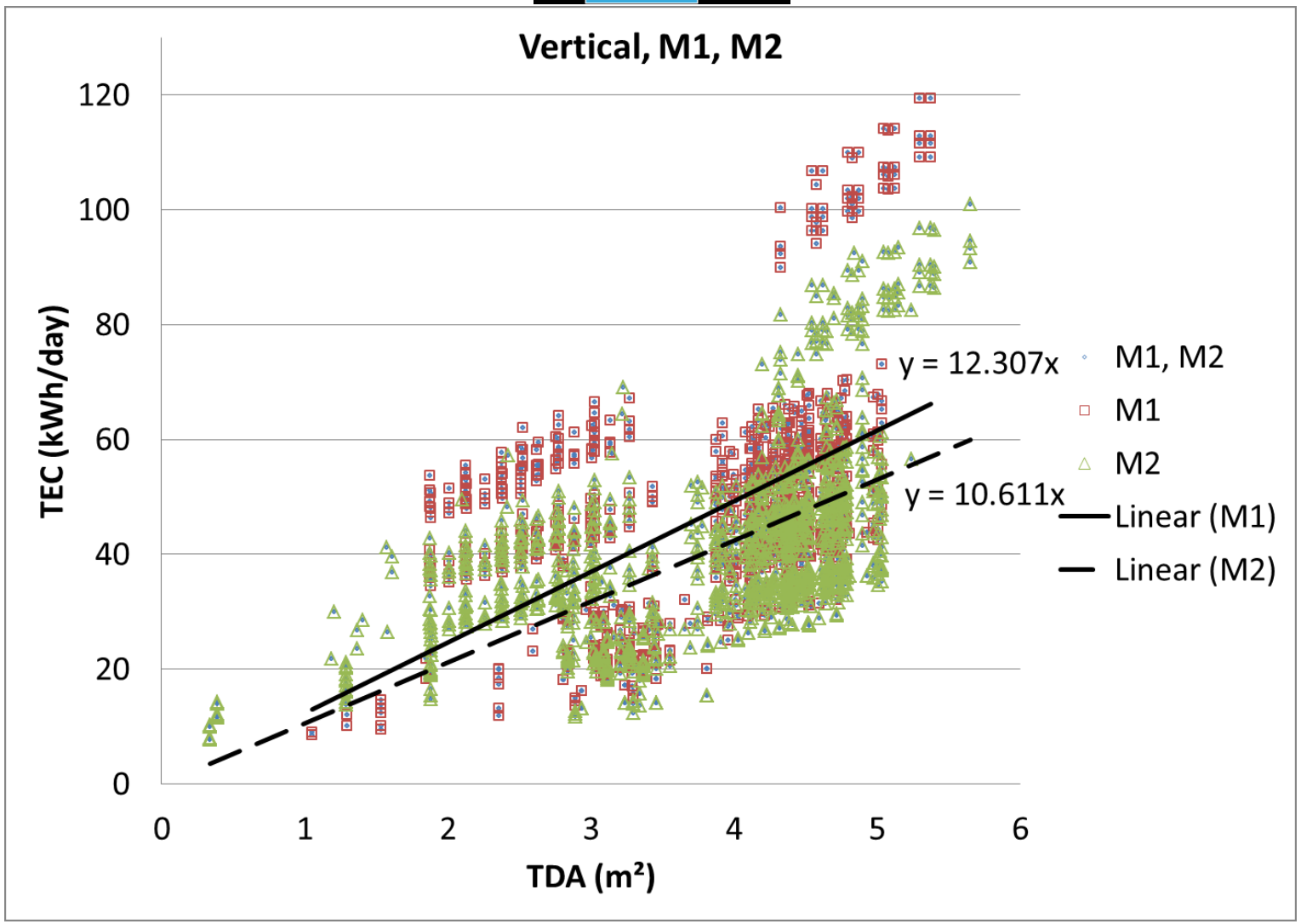
Supermarket segment

- **Data set detailed**

		Product temperature	Datapoints
Freezers	Vertical/combined (based on data from YF4, VF4, YM6)	L1	27 (26R: 8YF4, 18VF4 ; 1PI: 1YF4)
		L2	0
		L3	32 (8R: 8YF4 ; 24PI: 12YM6, 12YF4)
	Horizontal (based on data from HF5, HF6)	L1	24 (0R ; 24PI: 24HF6)
		L2	4 (3R: HF6 ; 1PI: HF6)
		L3	7 (7R: 3HF5 ; 4HF6, 0PI)
Refrigerators	Vertical/combined (based on data from VC1, VC2, VC3, VC4, YC4)	M1	922 (898R: 220VC1, 551VC2, 126VC4, 1YC4 ; 24PI: 24 VC4)
		M2	1206 (1121R: 225VC1, 743 VC2, 34VC3, 119VC4 ; 85PI: 13VC1, 72VC2)
		H	167 (162R: 22 VC1, 140 VC2 ; 5PI: 3VC1, 2VC4)
	Horizontal (based on data from HC1, HC2, HC3, HC6, HC7)	M1	50 (28R: 21HC1, 7HC3 ; 22PI: 7HC2, 14 HC6, 1HC7)
		M2	91 (91R: 71HC1, 20 HC3 ; 0PI)
		H	19 (9R: 3HC1, 6HC3 ; 10PI: 8HC4, 2HC6)


Vertical freezer, closed
TEC (kWh/day)
TDA (m²)
y = 19.427x
y = 18.554x
L3
L1
Linear (L3)
Linear (L1)
0
10
20
30
40
50
60
70
80
0
1
2
3
4

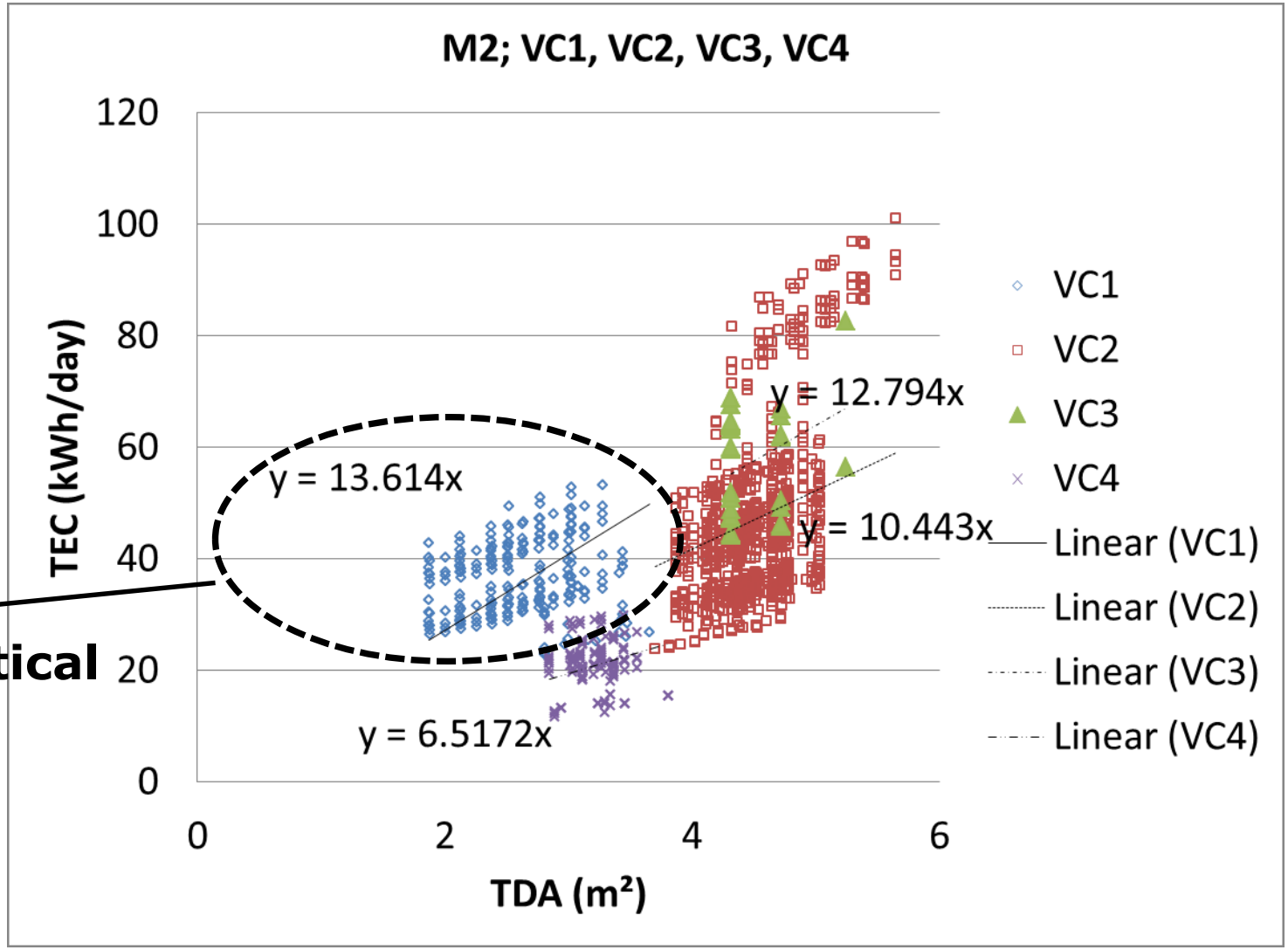
Supermarket segment



Supermarket segment

Vertical

M2: y = 10.6x

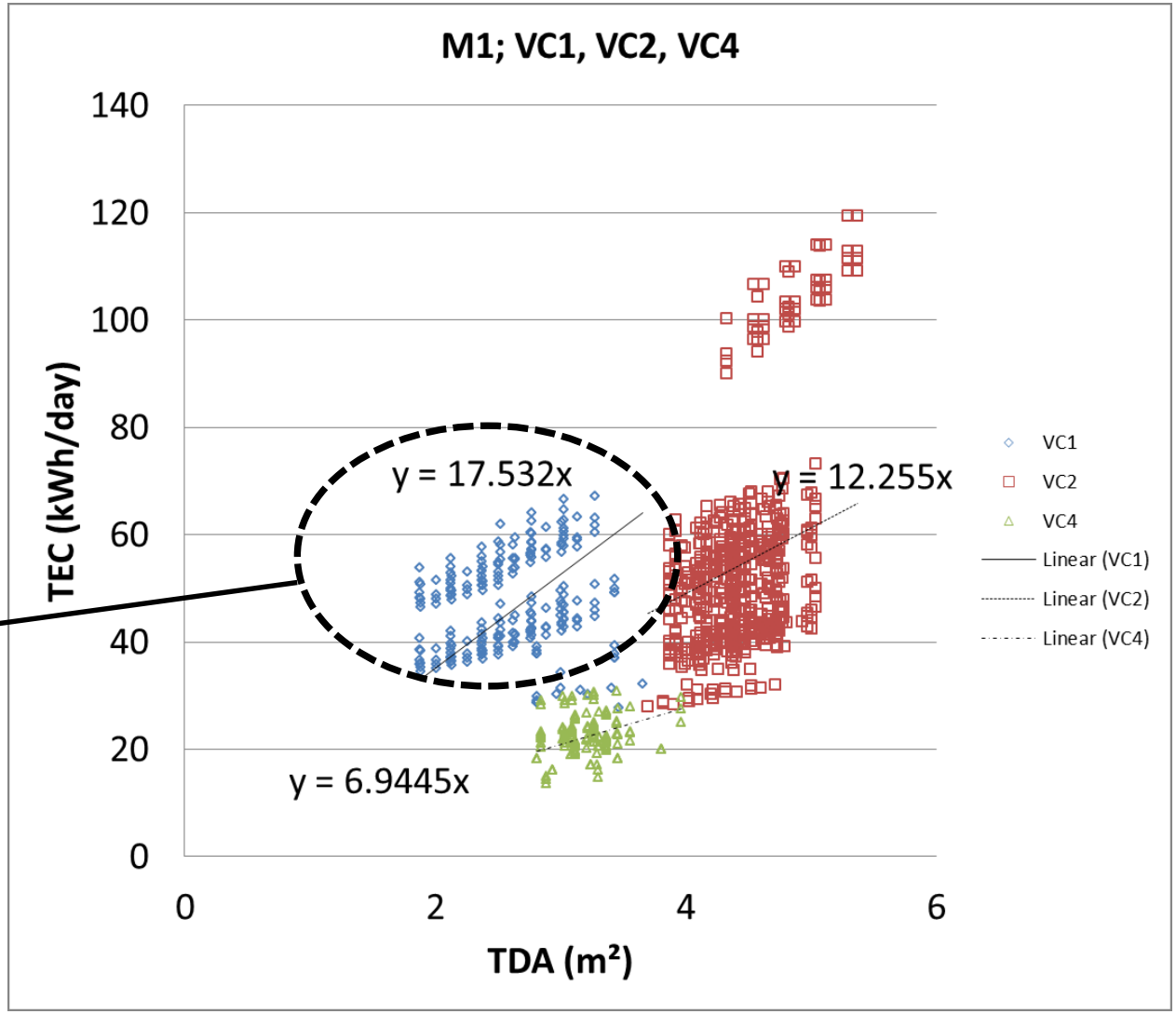


VC1, semi-vertical

Supermarket segment

Vertical

M1: y = 12.3x



VC1, semi-vertical

Improvement options

Savings on total cabinet energy efficiency

Improvement option	Saving estimates on total energy consumption
LED (depending on location and amount)	-5%
Electronic fans	-5%
Night curtains and double air curtains	-10%
Doors and closing of open cabinets	-40%
Refrigerant substitution	-10%
Aerodynamics, proper production/construction	-25%

Non-exhaustive list, non-accumulative

Questions

- What is your opinion about the proposed segmentation?
- Is a separate classification for semi-vertical refrigerators needed as about 30% higher E consumption? Are they clearly defined? Horizontal, vertical, semi-vertical?
- What is your opinion on not differentiating between plug-in and remote appliances?
- Do you agree on the proposed formulas for energy consumption?
- Also for categories where the amount of data points is low (*i.e.* freezers)? L2 estimation?

Questions

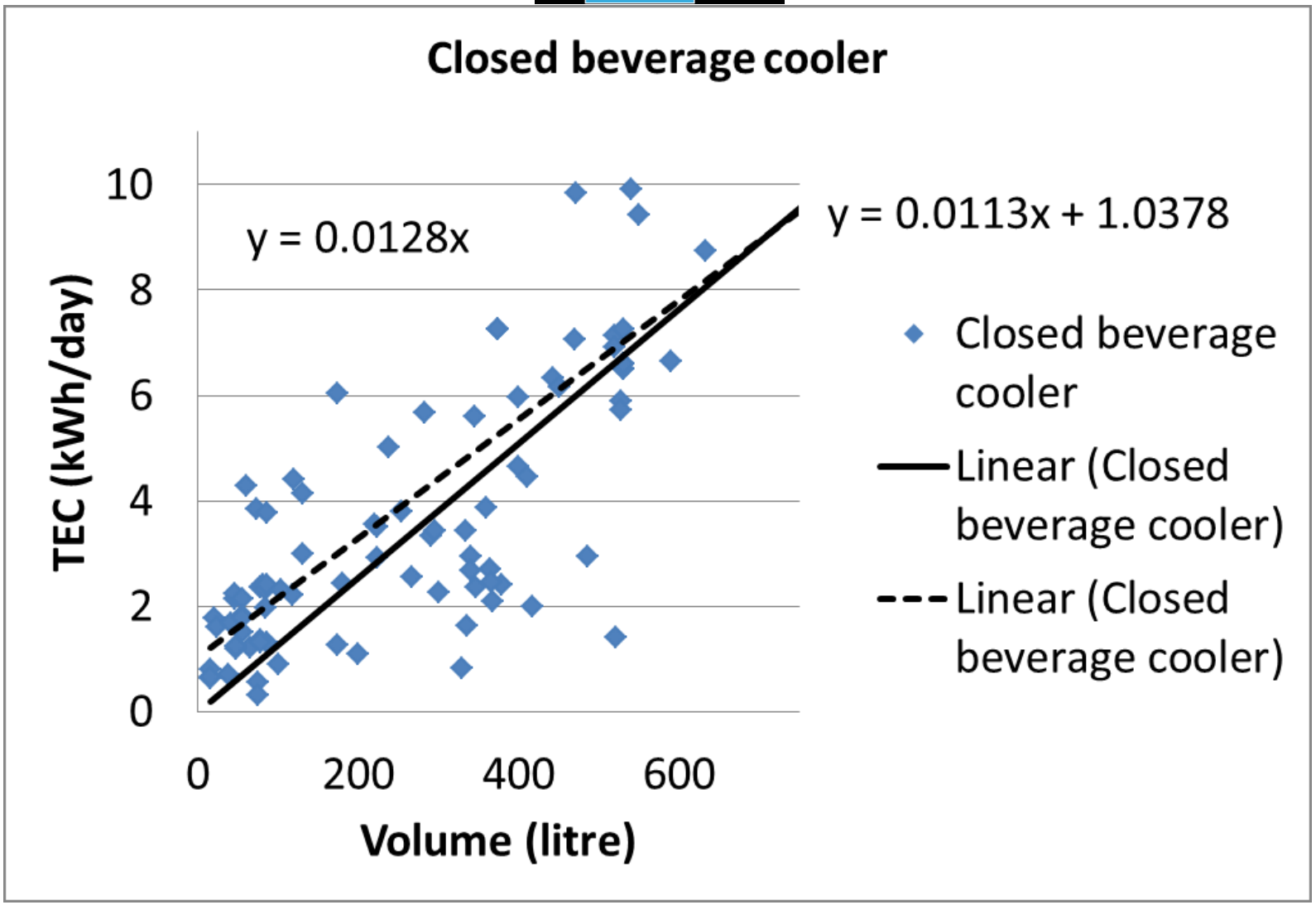
- What is your opinion on defining energy consumption for all freezers at temperature class L1 and for refrigerators at M2?
- What is your opinion on the absence of an off-set constant C_1? How should that constant be defined as it does not result from the data?
- Do you agree with the improvement potentials listed?

Beverage coolers

Beverage coolers

- **Data set**
  - 128 datapoints (117 closed coolers, 11 open coolers)
  - 117 datapoints used (closed coolers)
  - Most tested with brand protocols and estimated/calculated to ISO23953. 15 direct measured with ISO23953
  - Non-sales weighted

Beverage coolers



Beverage coolers

- **Proposed formula**

Beverage cooler	TEC kWh/day	C_1 kWh/day	C_2 kWh/(day.litre)	V litre
a. Split data: **closed BCs**	TEC =	**2.1 +** **1.0 +**	**0.010** **0.011**	Volume
b. Split data: **open BCs**	TEC =	**7.4 +**	**0.025**	Volume

Improvement options

Savings on total cooler energy efficiency

Improvement option	Savings on total energy consumption
LED (depending on location and amount)	-10% (big coolers), -15% (small coolers)
Electronic fans	-10%
Variable speed compressor	-15%
Night curtains	-26%
Doors and closing of open cabinets	-40%
Refrigerant substitution	-10%
Energy management device	-5% (only fans off), -30% (higher T)

non-accumulative

Questions

- Do beverage coolers have to be treated as a different category (volume) or as supermarket segment IVC4 (TDA)?
- What could be a good definition for beverage coolers? Pull-down versus hold temperature?
- Would it be sufficient to define these appliances as intended to use for non-perishable goods? Would this be sufficient to differentiate a beverage cooler from a plug-in, closed, vertical refrigerator from the supermarket segment?
- Do you agree on the proposed options for the EU market average energy consumption?

Questions

- What is the market share of open beverage coolers?
- Do you have an idea of the market for static air beverage coolers?
- Which options for testing and rewarding the installation of energy management devices would you see most feasible?
- Do you agree with the improvement potentials listed?

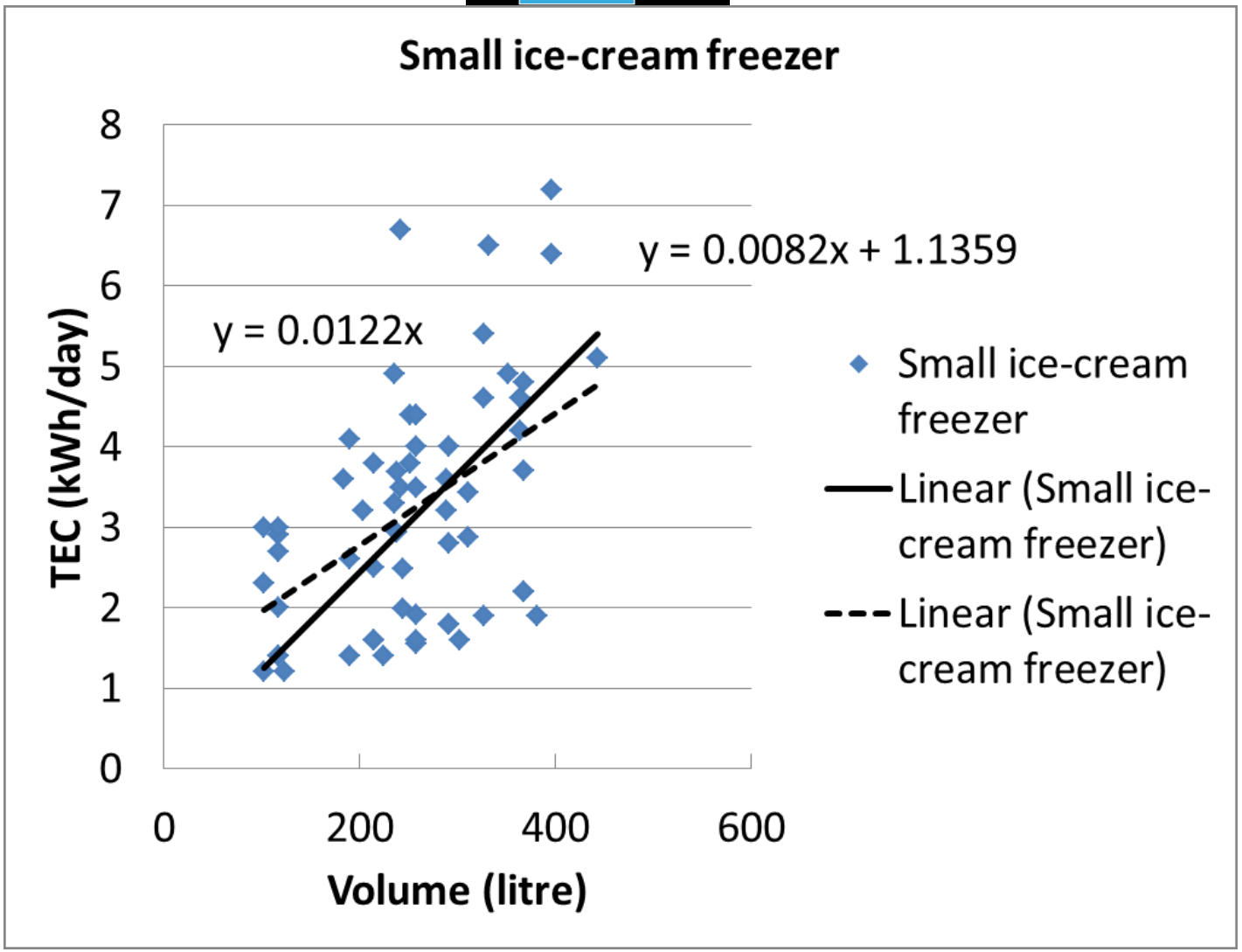
Small ice-cream freezers

(V < 500 litre, TDA < 1.1 m²)

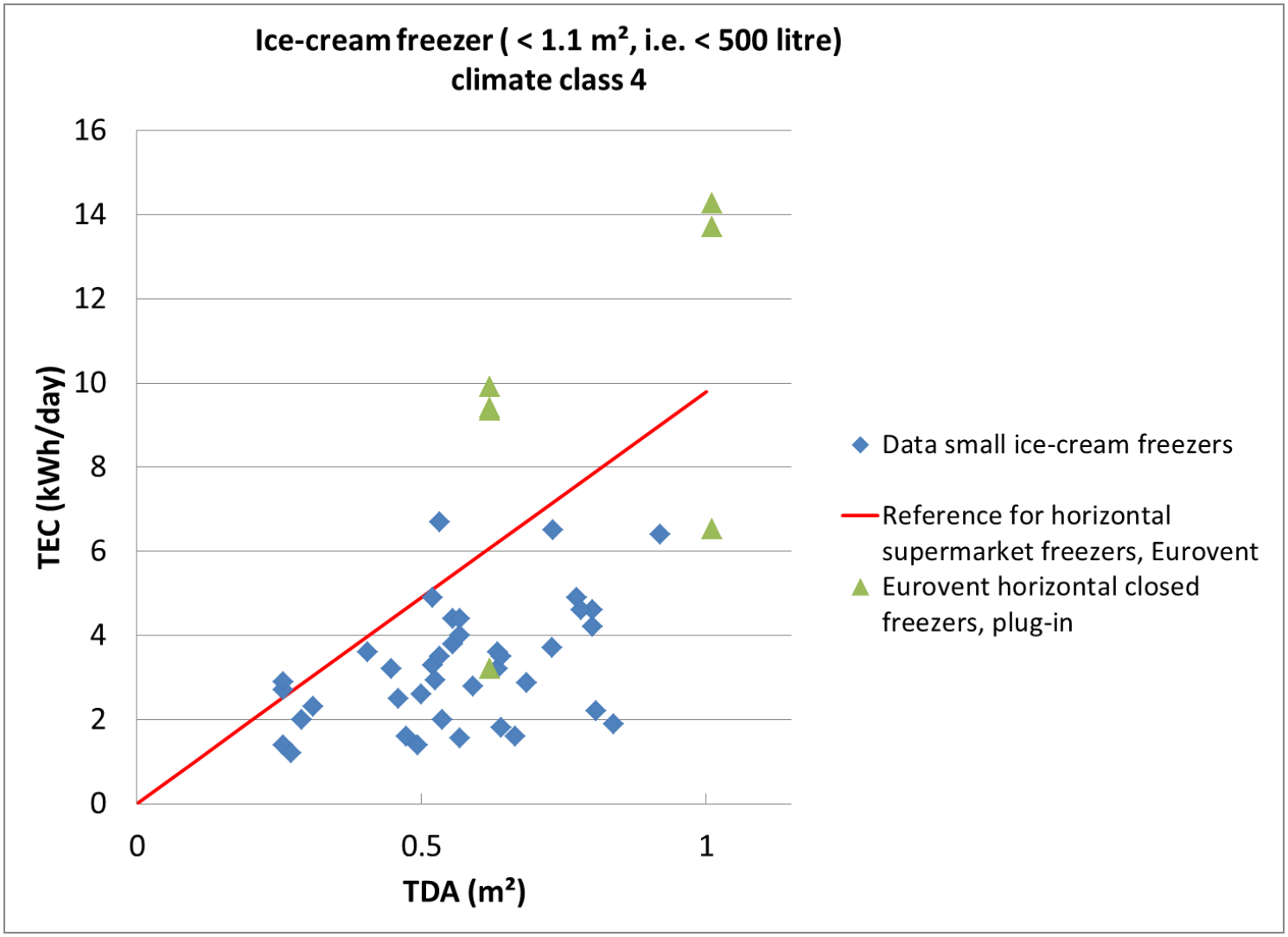
Small ice-cream freezers
V < 500 litre, TDA < 1.1 m²

- **Data set**
  - 61 datapoints (53 from same source, 8 control points)
  - Datapoints representing different refrigerants (R404A:19, R134a:4, R290:18, R600a:18, R507:2)
  - ISO 23953, climate class 4
  - Non-sales weighted

Small ice-cream freezers



Small ice-cream freezers



Small ice-cream freezers

- **Proposed formula**

Small ice-cream freezer	TEC kWh/day	C_1 kWh/day	C_2 kWh/(day.litre)	V litre
JRC latest, volume	TEC =	**1.32 +** **1.14 +**	**0.008** **0.008**	Volume

Supermarket freezer, horizontal L1	TEC kWh/day	C_1 kWh/day	C_2 kWh/(day.m²)	TDA m²
JRC latest, TDA	TEC =		**9.8**	TDA

Small ice-cream freezer	TEC kWh/day	C_1 kWh/day	C_2 kWh/(day.m²)	TDA m²
JRC latest, TDA	TEC =	**1.19 +** **1.03 +**	**3.7** **3.7**	TDA

Improvement options

Savings on total freezer energy efficiency

Improvement option	Savings on total energy consumption
LED (depending on location and amount)	-10%
Electronic fans	-10%
Variable speed compressor	-15%
Refrigerant substitution	-10%

non-accumulative

Questions

- Do small ice-cream freezers have to be treated as a different category? If they are under the supermarket segment, MEPS will be more lenient for small ice-cream freezers.
- Which metric do you think is best: TDA or net refrigerated volume?
- Could the threshold of V = 500 litre or TDA = 1.1 m² be easily circumvented to comply with possibly less stringent MEPS for horizontal, freezers of the supermarket segment?

Questions

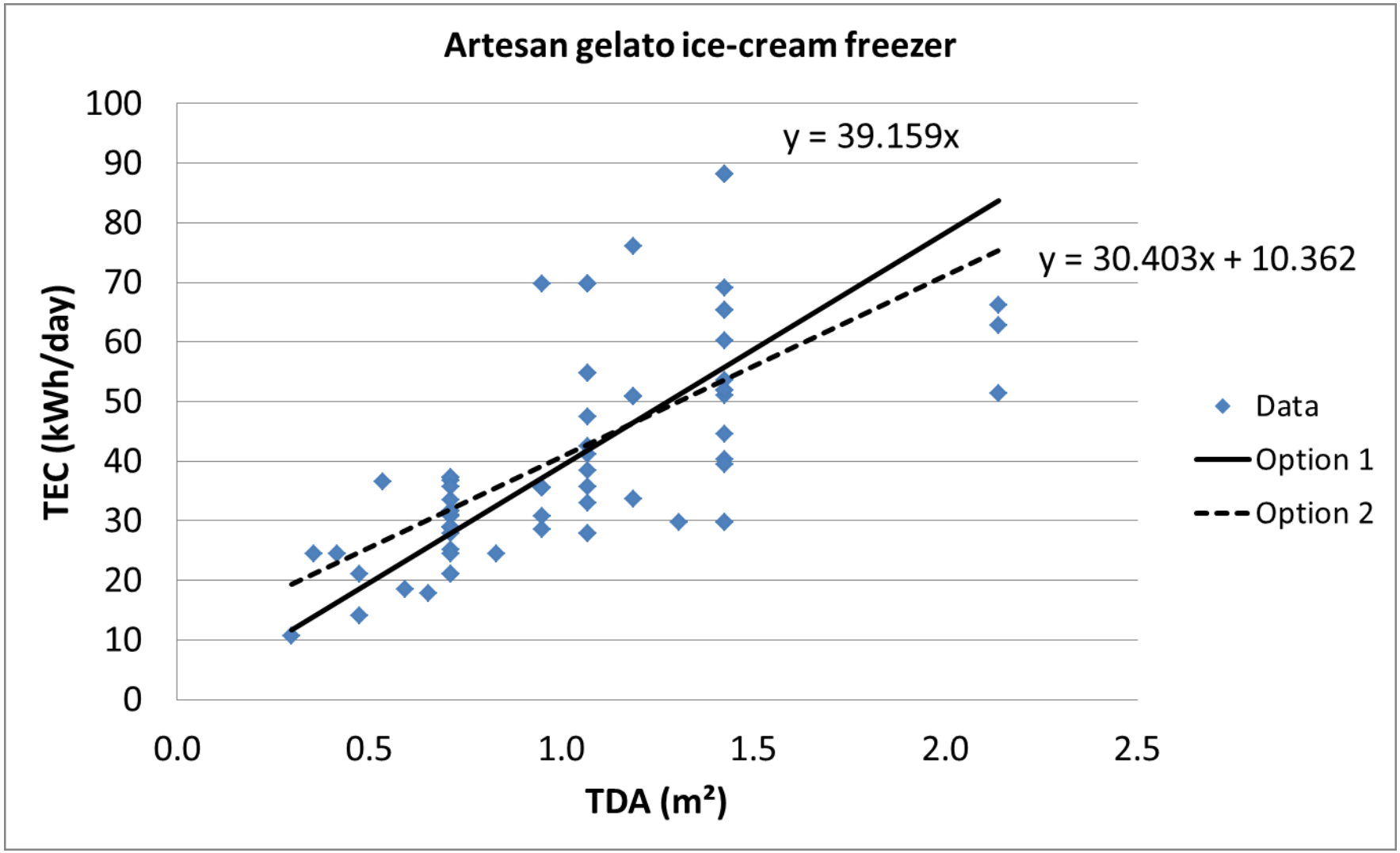
- Do you agree with the improvement potentials listed?
- What is your opinion on testing these appliances at climate class 4 (T= 30° C, RH = 55%), while other appliances probably will have to tested at climate class 3 (T= 25° C, RH = 60%)? Could this be an extra burden for manufacturers?

Artesan gelato ice-cream freezers

Gelato ice-cream freezers

- **Data set**
  - 73 datapoints
  - Measured with a protocol specific for these appliances, standard will be developed

Gelato ice-cream freezers



Gelato ice-cream freezers

- **Proposed formula**

Artisanal gelato cabinets	TEC kWh/day	C_1 kWh/day	C_2 kWh/(day.m²)	TDA m²
Option 1	TEC =	**0 +**	**39.2**	TDA
Option 2	TEC =	**10.4 +**	**30.4**	TDA

Improvement options

Savings on total gelato freezer energy efficiency

- Unknown

Questions

- What are the improvement potentials for gelato ice-cream freezers? What differentiates an efficient one from a non-efficient one? Same options as for plug-in cabinets?

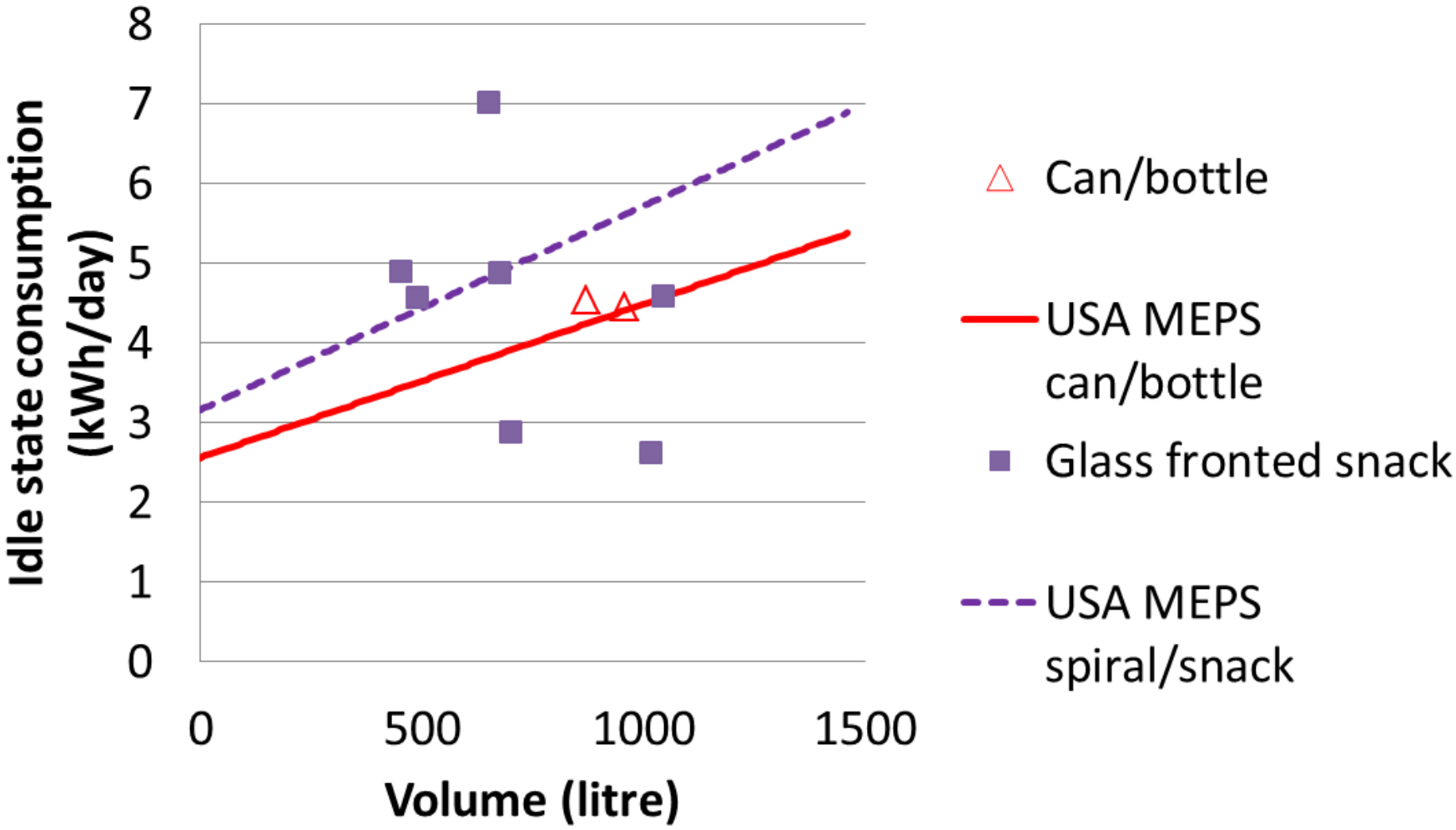
Questions

- Do you agree on the proposed options? Which one would fit best?
- A standard for these appliances is currently developed. Will that follow the measurement protocol that has been used for the data that have been provided or are significant differences expected?

Vending machines

- **Data set**
  - 11 European datapoints, mixed for different appliances (can/bottle, glass-fronted spiral) and scattered
  - Market Transformation Programme, Defra UK,2009: Cold Vending Machines Government Standards
  - IEA 4E benchmarking report, 2012
  - More data available from USA and Canada
  - Standard is under development based on EVA-EMP 3.0a protocol. Currently at CENELEC for verification

Vending machines



Vending machines

- **USA MEPS**

Equipment Class	TEC (kWh/day)
Class A, **can/bottle –** a bottled or canned beverage vending machine, fully cooled	TEC = 0.055 x V + 2.56
Class B, **spiral/snack –** a bottled or canned beverage vending machine, zone cooled	TEC = 0.073 x V + 3.16

Market Transformation Programme, Defra UK,2009: Cold Vending Machines Government Standards

consumption (kWh/day)				
Year	**Basic machine**	**Basic with lighting timer**	**High efficiency**	**With motion sensor**
1980	14.4	13.2	11.5	7.6
1990	12.0	11.0	9.6	6.3
2000	10.6	9.7	8.5	5.6
2008	9.3	8.5	7.4	4.9
2020	8.3	7.6	6.7	4.4
2030	8.3	7.6	6.7	4.4

Ref. Market Transformation Programme, BNCR VM0X: Cold Vending Machines Government Standards Evidence Base 2009, Defra, UK

Improvement options

Savings on total vending machine energy efficiency

- Market Transformation Programme, Defra UK,2009: Cold Vending Machines Government Standards

Configuration	% reduction in annual consumption compared to "basic" machine
Basic machine – no efficiency features	0%
Basic machine with lighting timer	8%
High efficiency machine – lights timer and optimized refrigeration pack	20%
Retrofitted motion or usage sensor to switch off in silent hours	48%

Questions

- What is your opinion on an extrapolation of USA Energy Star or USA/Canadian MEPS, even if market is different?
- Is more energy consumption data available on a short term, ideally broken down by can/bottle machine, spiral glass-fronted, carrousel machine?

Thank you

Joint
Research
Centre

End-of-life

European Commission

Joint Research Centre

"2nd Technical Working Group Meeting on Ecodesign for Commercial Refrigeration"

ANALYSIS OF END OF LIFE OF COMMERCIAL REFRIGERATION APPLIANCES

F. Ardente, M. Calero, F. Mathieux

Joint Research Centre

Brussels – 10th December 2013

Outline:

- Goals and scope
- Outputs of the End of Life (EoL) Analysis
- Potential Ecodesign Measures
- Questions

Goals and scope

- To analyse the EoL treatments of commercial refrigeration appliances in EU, in order to identify criticalities of the treatments ("hot-spots").
- To identify related potential Ecodesign measures.

The analysis has been based on:

- interview and/or visits of 7 companies with recycling/refurbishing plants in various European countries (Italy, Germany, Belgium, Spain, France).
- Interview of manufacturers
- Interview of policy makers (European Commission and member states) dealing with EoL policies
- Information from the scientific/technical literature and available statistics

Outputs of End of Life Analysis

Identified "Hot-spots":

- **Durability of the products:** lifetime influences impacts through life cycle.
- **Large dimensions and composition of the products:** problems during the waste collection, delivery and movement in the recycling plants.
- **Content of refrigerants and oils:** these substances have to be extracted/ treated according to legislation.
- **Presence of components difficult to be treated** (when contained): Glass components (abrasion of shredders) and Fluorescent lamps and electronics (separately treated according to the legislation due to the content of polluting substances).
- **Treatment of insulation foams:** low recyclability of PUR.
- **Treatment of foaming agents:** some with high Global Warming potential (HFC) and other with risk of explosion (hydrocarbons).

Outputs of End of Life Analysis

Example of the analysis of potential Ecodesign requirements

Hot spot	Rationale	Possible strategy	Potential benefits	Potential problems / drawback	Potential Ecodesign requirement
Presence of components difficult to be treated / recycled	To simplify manual pre-treatments of waste at the recycling plant.	Design for dismantling of some components (glass parts, lighting systems, and electronics)	Reduced risk of dispersion of hazardous substances (in electronics and fluorescent lamps). Reduced safety risks for workers (in the case of glass). Higher recovery yields for some relevant materials (in electronics). Reduced labour costs.	- Commercial refrigeration appliances are generally very variable and designed according to specific requests of the client. This makes difficult to identify strict design for dismantling measures valid at the product group level. - Some components are intentionally designed to be difficult to be dismantled for security reasons (e.g. in vending machines). - Compact fluorescent lamps will be in the future progressively replaced by LED systems.	Products shall be designed in order that the following electric and electronic components (printed circuit boards, capacitors, LCD, switches, fluorescent lamps, when present) are easy to be located and manually extracted for the recycling. Manufacturers shall provide, upon request, technical evidences for this,
Treatment of blowing agents in insulation foams	Some foaming agents used in PUR have an impact on the GWP	Use of alternative foaming agents	Reduction of GWP of commercial refrigeration appliances (about 3% in vending machines, compared to the use of e.g. Pentane)	The potential ban of HFC in foams is currently under discussion within the policy debate on the restriction of fluorinated greenhouse gases.	No requirement proposed
	The preventive knowledge of the blowing agent used into insulations could help the recycling processes	Labelling of the type of foaming agent used into insulation foams.	Optimisation of the recycling processes into the shredders, with a reduction of the risks of flammability and the optimisation of the flows of nitrogen inflated.	It is difficult for manufacturers to measure the exact amount of foaming agent used in the product.	Manufacturers shall include in the back plate of appliances a marking with the name of the blowing agent used in the insulation foam(s)

Potential Ecodesign Requirements

<u>Design for extraction</u> of some key components:

Design of the appliances so that the following components (when present) can be easily extracted for recycling: printed circuit boards; capacitors; LCD; switches; fluorescent lamps.

This can for instance be ensured avoiding that they are glued, welded, or fixed with rivets (but fixed exclusively with screws or clamps).

Upon request, manufacturers shall provide technical evidence of manual removal, for instance:

- provision of graphic information (a short technical folder, a sequence of pictures or a video) showing the steps of the manual dismantling,

- standardized product information datasheet (in line e.g. with IEC/TR 62635/2012) that identifies the above listed elements.

Potential Ecodesign Requirements

<u>Design for extraction</u> of some key components:

Reasons for a potential requirement :

- Electronic components have to be extracted according to legislation
- These components contain various hazardous materials and, also, various valuable materials
- Interviewed recyclers highlighted the difficulty to identify and extract some electronics in the product.

Question:

What is your opinion about the proposal above on simple design actions to facilitate the extraction of key components and to be compliant with WEEE Directive?

Potential Ecodesign Requirements

Marking of blowing agent(s) in insulation foam(s)

Manufacturers shall include in the back plate of appliances a marking with the name of the blowing agent(s) used in the insulation foam(s)

Reasons for a potential requirement:

- Safety reasons (risks of explosion due to hydrocarbons used as foaming agents)
- Difficulties during the recycling (shredding in a inert atmosphere)

Question:

What is your opinion about the proposal above on marking of the blowing agent(s), to facilitate safer recycling of it?

Potential Ecodesign Requirements

Limiting the use of HFC in insulation foam(s)

No ecodesign requirement on this issue is proposed at this stage.

Reasons for a potential requirements:

- The use of HFC in insulation foams is relevant in terms of life cycle impacts (responsible up to 3% of GWP) and it should be limited.
- The insulation with HFC has to be carefully treated according to the legislation (in closed shredders with air suctions)
- Current negotiations on a ban of foaming HCF gases within the review of the F-Gas regulation.

Question:

What is your opinion about the consequences of the potential ban of the use of HFC in insulation foams of commercial refrigeration appliances, as currently discussed in the F-gas regulation negotiations?

Additional Questions

Additional requirements

Do you suggest any other relevant ecodesign requirement for End of Life of commercial refrigeration appliances?

European Commission

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