The ProCold project

www.topten.eu/pro-cold

Empowering stakeholders to deliver highly energy efficient professional cold products using natural refrigerants

PRO Cold

2015 – 2018

February 2018

Editors

ProCold Consortium

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Executive Summary

The ProCold project

www.topten.eu/pro-cold

Empowering stakeholders to deliver highly energy efficient professional cold products using natural refrigerants

1 FEBRUARY 2015 – 31 JANUARY 2018

PARTNERS

9 partners presenting complementary backgrounds: energy specialists, energy agencies and research institutes, and environmental NGOs with communication competencies.

ADEME, French Agency for Environment and Energy Management (coordinator)
Austria: Austrian Energy Agency, AEA
Czechia: The Energy Efficiency Center, SEVEn
France: Guide Topten
Germany: Oeko-Institut e.V.
Italy: Politecnico di Milano
Portugal: Quercus
Sweden: Swedish Society for Nature Conservation
Switzerland: Bush Energie GmbH

Partners thank the WWF who supported the ProCold activities.

BUDGET

Budget funded by the H2020 programme: 1.18 M€ (around 43 000€/partner/year).

PURPOSE

At a time when new regulations were coming into force in the professional and commercial cold sector, the project activities were designed to support all stakeholders active in this sector, and to cover specifically plugged-in products:

- Refrigerated storage cabinets
- Refrigerated display cabinets
- Beverage coolers
- Ice cream freezers
- Vending machines
- Wine coolers
- Minibars

ProCold aimed to support the most energy efficient models using climate friendly refrigerants and used five main means of action:

1) It continuously studied the market, identified the best models and published this information on-line to increase market transparency.

2) It participated in policy developments for professional and commercial cold products.

3) It accompanied key stakeholders at the European and national levels.

4) It organised a product competition.

5) It disseminated its activities in the media, specialised press and during professional events and scientific conferences.

KEY RESULTS

- 9 websites presenting continuously updated selections of best appliances and selection criteria.
- 16 product categories scanned, highlighting the 170 most energy efficient models supplied by 30 different brands.
- 2 market studies on professional cold cabinets and their distribution according to their energy class on the EU label.
- A successful Product competition: entries were received and winners identified in each of the 5 categories open to the competition. An Award ceremony was held at the EuroShop fair in March 2017.
- 13 tests undertaken at selected laboratories in order to gain technical knowledge on products and standardisation processes.
- 2 measurement campaigns organised at retailers' and canteens' premises to gain knowledge on "real life" energy consumption.

- 2 ProCold calculators enabling end-users to compare their models' energy consumption, costs and CO_2 emissions to the ones of the Topten listed products.
- Topten and ProCold logos used by 29 manufacturers to label their products.
- 1 195 stakeholders reached and informed about the project.
- 2 rebate programmes implemented in Switzerland and Austria, based on the ProCold project (55 millions of kWh saved over 3 years in Switzerland).
- A variety of brochures and procurement guidelines available in 6 languages.
- 29 press releases and more than 150 publications in the professional press.
- 25 participations in fairs and conferences, presenting the project.
- Policy recommendations for professional cabinets, commercial cabinets and standardisation issues.
- 355 GWh saved thanks to additional best models sales (Primary energy savings triggered within one year: 296 GWh).

STAKEHOLDER GROUPS AND MAIN BENEFITS BROUGHT BY THE PROJECT

Market Actor	ProCold Value Proposition
Manufacturers	Support market introduction of new efficient products Provide independent, objective marketing of products Channel incentives and increase demand for innovative products Gain competitive advantage by having their best products listed on topten.eu
Food and beverage companies	Communicate benefits of efficient products for climate protection Help meet environmental targets and CSR goals Help bring more profit to their customers by reducing their electricity costs
Retailers and direct users	Communicate benefits of efficient products from reduced total life-cycle costs and for climate protection Reduce operating costs to enhance value-for-money Support formulation of procurement specifications and award criteria Support brand recognition
Public authorities	Provide real-time market data on the “best” products Pave the way for new and more stringent standard & label specifications Serve as a basis for rebate programmes Support formulation of procurement specifications and award criteria Reduce operating costs to enhance value-for-money
Service companies	Raise capacities to advise their clients Select better models to be installed at their clients' premises
Media, NGO, etc.	Serve as credible, independent source of information Material and information for their campaigns

Introduction

20 years ago, the first EU regulations for cold products in the domestic sector came into force: today, on the energy label, A+ is the lowest class admitted on the market. Although it cannot always compare directly, in the professional and commercial sector, cold products seem to be far less efficient: in 2015 there were 12 times less plug-in commercial and professional product in use than household models, but the household sector only used 2 times more energy (84 TWh/a against 43 TWh/a). Large reduction of energy consumption and CO_2 emissions are possible, through well-targeted and well-implemented regulations: expected savings range from 50 to 75% depending on product categories.

The EU has acknowledged this situation and the first regulations for professional products (i.e. storage cabinets) were adopted in 2015, making these product categories the first professional products covered by the Ecodesign and Energy Labelling Directives (minibars and wine coolers for domestic use are already regulated, but the boarder between domestic and professional or commercial use is not sharp).

As this regulating process is new to a sector in which procurement chains are complex and split incentives are common, all stakeholders need to be accompanied – the ProCold activities have been developed to support all stakeholders active in this sector, and specifically covered plugged-in refrigerated storage cabinets, refrigerated display cabinets, beverage coolers, ice cream freezers, vending machines, wine coolers and minibars.

ProCold aimed to support the most efficient models – at the same time using climate friendly refrigerants – by identifying them and making the information easily available, and by educating both the supply and demand side of the market. The objective was to ensure more energy efficient professional and commercial cold products enter the EU market and to increase their market shares, thereby contributing to the EU's energy efficiency goals and policies.

ProCold gathered, checked and disseminated neutral information on products' energy consumption, on refrigerants' global warming potential, and on saving potentials. Stakeholders were therefore

⟫ Plugged-in refrigerated display cabinets

⟫ Ice-cream freezers

⟫ Beverage coolers

⟫ Minibars

⟫ Refrigerated vending machines

⟫ Wine coolers

⟫ Refrigerated storage cabinets

motivated to take action, i.e. produce / procure / support through policies more energy efficient and climate friendly models and technologies. ProCold worked with 5 stakeholder groups, both at the European and at the national levels:

- ***Public authorities*** *in designing policies and for their procurement policies.*
- ***Manufacturers*** *to motivate them to develop more efficient products.*
- ***Food and beverage industry*** *who procure and provide the cold appliances in which they sell their own food and beverage products.*
- ***Retailers and other direct users – shops, hotels, restaurants and canteens, snack shops, office buildings, etc.*** *– providing space and electricity for the cold professional products, but actually have little information and power in specifying the products to be used.*
- ***Service providers,*** *advising and influencing users and/or owners on which models to choose.*

In order to promote energy savings and the use of natural refrigerants in the sector of plugged-in professional and commercial cold cabinets, the ProCold project worked on two main axis:

- *Identifying and highlighting the most energy efficient products using refrigerants with a low global warming potential (GWP), such as R290, R600a or CO_2.*
- *Working directly with stakeholders to raise their awareness and engage them in concrete actions.*

This report summarises the ProCold project activities and is composed of 6 main sections:

- ***Section 1*** *presents the professional and commercial plugged-in products that ProCold worked on, the market situation and evolution during the project, especially for the top-end segment.*

- ***Section 2*** *zooms in on one activity to stimulate industry on super efficient appliances: the organisation of the ProCold European product Competition.*
- ***Section 3*** *zooms in on the lessons learned from various ProCold testing in campaigns in laboratories and measurement campaigns on the field.*
- ***Section 4*** *presents the many activities organised to reach out and motivate all stakeholders.*
- ***Section 5*** *summarises the ProCold policy recommendations.*
- ***Section 6*** *presents the results of the ProCold project in terms of energy savings.*

Though the project is formally over, the Topten network continues to work on plugged-in professional and commercial cold products, so stay tuned on www.topten.eu/pro-cold! ■

1 – PROCOLD BASICS 1: WORKING ON ENERGY EFFICIENT PLUGGED-IN CABINETS

IDENTIFYING AND HIGHLIGHTING ENERGY EFFICIENT PRODUCTS: THE USE OF THE TOPTEN APPROACH

In the B2B sectors, professional buyers are knowledgeable about the functions of the products they buy, but not necessarily about their energy and environmental characteristics, especially when there is no or only very recent obligation to provide standardised information on these topics. It is therefore very useful to be able to rely on impartial quality information.

The ProCold project used the "Topten approach" which has been implemented for a lot of plugged-in products in the domestic sector for many years. A European network of product experts continuously study the market to identify the most energy efficient products. When products comply with the "Topten selection criteria", they are displayed with their characteristics on the www.topten.eu website and various cooperation and dissemination activities towards buyers and policy makers reward manufacturers for their specific efforts in the field of energy efficiency and other environmental topics. When the market gradually progresses, it becomes possible to tighten the Topten selection criteria in order to always select the most efficient products.

Topten

is a market transformation tool that builds a bridge between the supply side and the demand side for quality products.

The organisations working on the ProCold project are part of the Topten network and have applied the Topten approach to the professional and commercial cold plugged-in products (www.topten.eu/pro-cold). The product selection served to establish a dialogue with manufacturers and to obtain from them comparable information on their products regarding energy consumption performances, and the type and quantity of refrigerant used.

Find out best professional and commercial cold plugged-in products in Europe

The ProCold project identified and promoted products that comply with strict selection criteria in terms of energy efficiency and the use of natural refrigerant (global warming potential ≤ 3).
On www.topten.eu/pro-cold, the selection criteria and lists of complying products are displayed, with all their technical characteristics in the following product categories:

Professional cabinets (regulations n°2015/1094 and n°2015/1095)

- *Storage refrigerators*
  - Storage counter refrigerators
  - Storage refrigerators 1-door
  - Storage refrigerators 2-doors
- *Storage freezers*
  - Storage counter freezers
  - Storage freezers 1-door
  - Storage freezers 2-doors
- *Storage refrigerator-freezers*

Commercial cabinets

- *Beverage coolers*
- *Ice Cream freezers*
- *Horizontal display freezers*
- *Vertical display freezers*
- *Vertical chilled display cabinet*
- *Refrigerated vending machines*

Domestic cabinets for professional/ commercial use (regulations n°643/2009 and n°1060/2010)

- *Minibars*
- *Wine coolers*
  - One temperature zone
  - Multi temperature zones

Brand	Vestfrost	Vestfrost	Vestfrost	Liebherr	Vestfrost	Vestfrost	Gamko	Vestfrost	Frigoglass	Vestfrost	Inefficient model
Model	FKG 274	CC45	CC61	FKDPv 4503	M190	M180	E3/2222GMU84	CFKS 471	ICOOL-1300 HD C (R744)	M200 CO2 Standard	
Other models						M150	E3/2222GMU82, E3/2222GMUCS82, E3/2222GMUCS84, E3/2222MU82, E3/2222MU84, E3/2222MUCS82, E3/2222MUCS84				
Electricity costs (€ in 8 years)	200	131	219	718	877	902	1642	925	3797	1386	4264
Net volume (liters)	210	45	60	327	548	351	665	333	1247	379	500
Storage temperature (°C)	+4 ... +12	+2 ... +10	+2 ... +8		+2 ... +10	+2 ... +10	+2...+18	+2 ... +10	0...+10	+2...+10	0...+15
Temperature class	K4	K4	K4	K1	K4	K4	M1	K4	M2	K4	M1
Draft energy index	9.1	14.2	21.3	23.4	27.0	27.8	29.1	29.7	37.8	40.4	97.3
Energy (kWh/year)	125	82	137	449	548	564	1'026	578	2'373	866	2'665
Refrigerant	R600a	R600a	R600a	R600a	R600a	R600a	R600a	R600a	R744	CO2	R134a
Cooling	static	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air	Forced-air
Countries available	EU	EU	EU	AT, CH, CZ, DE, FR, IT, PT, SE	EU	EU	EU	EU	EU	EU	EU

Illustration 1 - ProCold / Topten beverage coolers product list

Illustration 1 shows an example of the ProCold / Topten product list for beverage coolers displaying all the technical characteristics of the selected models: brand, model, electricity costs, net volume or total display area, temperature class, climate class, energy efficiency index (or draft energy efficiency index according to the latest available draft regulation texts), type of refrigerant, type of cooling, etc.

To identify the most energy efficient products and design its selection criteria, Topten uses as a basis the **legal context** to obtain product data that is comparable. During the ProCold project, between 2015 and 2018, this legal context evolved:

- *Minibars and wine storage appliances for household use were already covered by the regulation for household cold appliances[1]. (Use for a professional or a commercial purpose fall into a gap between the scopes of EU regulations for professional / commercial products and household products).*
- *The European Energy Labelling and Ecodesign for professional refrigerated storage cabinets entered into force in July 2016[2].*
- *The regulation for commercial refrigerated display cabinets was delayed but draft texts and draft standards (May 2014) could be used to engage a dialogue with manufacturers.*
- *For all product categories, the "F-gas" regulations will oblige manufacturers to shift to better refrigerants. The EU will ban climate-damaging refrigerants with a high global warming potential (GWP) such as R404A from 2020 and R134a from 2022. As the use of green refrigerants has a positive impact on energy efficiency, this was a supportive argument for ProCold which used as a selection criterion at first a GWP < 150, then from October 2017 ≤ 3 (compared to GWPs of ca. 1 400 for R134a and ca. 4 000 for R404A).*

PROFESSIONAL PLUGGED-IN CABINETS – ENERGY CLASSES DISTRIBUTION

As soon as the European Ecodesign and Energy Labelling regulations entered into force for professional products in July 2016, ProCold undertook a research on the availability of products according to energy classes. The project researched on the internet in November 2016 and September 2017 a variety of products categories covered by the new energy label. The samples showed that a large share of products offered on the market do not display their energy label, and that there was only a slight improvement between 2016 and 2017

It has to be noted however that manufacturers are not strictly obliged to show the label on-line if the price of the product is not also displayed – which is rather seldom for B2B products. The many cases of absence of the energy label on manufacturers' websites may be explained by this lack of obligation, by the relatively low energy classes of many products, by the fact that buyers are not yet used to systematically demand this information, etc.

When looking at the labelled products, the research shows that the energy label scale was well designed: products are distributed in almost all energy classes, but there is enough room for progression towards the most efficient classes – i.e. the energy label can evolve over the next years. For the samples observed, between 2016 and 2017, the whole market has shifted towards better performing classes (more B class models, more C class models; less D class models).

This kind of research cannot be done for the commercial cold products until regulations are adopted and manufacturers are obliged to declare standardised information on energy performances.

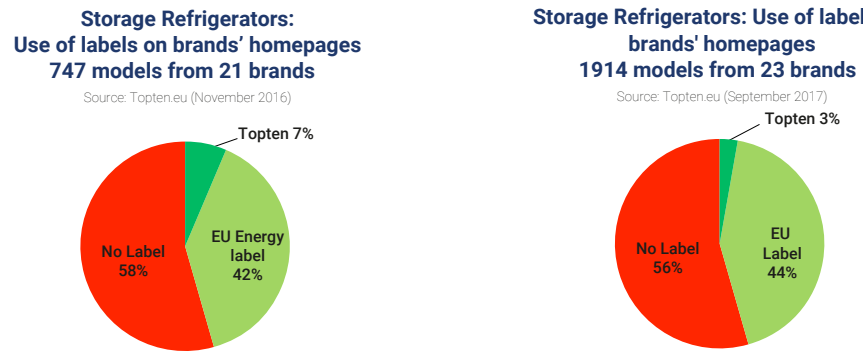


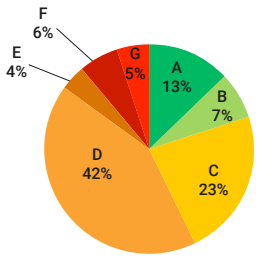
Illustration 2 - Display of labels on line for professional cold plugged-in products

[1] Commission regulation (EC) No 643/2009 (...) with regard to ecodesign requirements for household refrigerating appliances and Commission Delegated Regulation (EU) No 1060/2010 (...) with regard to energy labelling of household refrigerating appliances

[2] Commission Delegated Regulation (EU) 2015/1094 (...) with regard to the energy labelling of professional refrigerated storage cabinets and 2015/1095 (...) with regard to Ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers

Storage Refrigerators: Share of energy classes Based on 373 labelled models from 14 brands

Source: Topten.eu (September 2016)



Storage Refrigerators: Share of energy classes Based on 839 labelled models from 16 brands

Source: Topten.eu (September 2017)

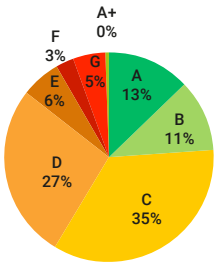


Illustration 3 - Distribution of labels on line for professional cold plugged-in products

ENERGY PERFORMANCE - MARKET EVOLUTION IN THE HIGH-END SEGMENT

At the end of the project in January 2018, 30 brands were present on the Topten websites, displaying their most energy efficient models:

- *Storage refrigerators, freezers and refrigerator-freezers: Adande, Alpeninox, Angelo Po, Cool Compact, Coreco, Desmon, Efficold, Electrolux, Gemm, Gram, Ilsa, Liebherr, Mercatus, Sagi*
- *Beverage coolers: Frigoglass, Gamko, Liebherr, Vestfrost*
- *Ice cream freezers: AHT, AHT/Unilever, Liebherr*
- *Horizontal display freezers: AHT, ArcaBoa, Carrier, Novum*
- *Vertical chilled display cabinets: Carrier, Docriluc, Fogal Refrigeration*
- *Vertical display freezers: AHT, Carrier*
- *Refrigerated vending machines: Sielaff*
- *Minibars: Dometic, Indel B, ISM*
- *Wine coolers: Eurocave, Liebherr*

The table below shows the evolution of the number of models and manufacturers displayed on the Topten website between 2015 and 2018. Even though the selection criteria could be tightened – as the market progressed, they could become more demanding in terms of energy efficiency and lower global warming potential – more manufacturers were able to propose more models in this top-segment of the market. The number of manufacturers has tripled, showing a motivation to develop highly efficient technologies, and the number of models has doubled. As an example, very few super-efficient 1-door storage refrigerators were available on the market at the start of the project, and hence the Topten selection criteria accepted models in energy class from A to D. By the end of the project 3 years later, only class A products were accepted and almost 20 different models could reach this level.

Market development for professional cold storage cabinets

Illustration 4 shows the market development of the 7 storage refrigeration categories from the start to the end of the ProCold project. One can note that the market was almost static until the introduction of the energy label in July 2016 – as shown in more detail by the example of the 1-door storage refrigerators (see illustration 6).

- *The first A+ model (counter refrigerator) entered the market less than a year after the coming into effect of the energy label.*
- *Product groups with the highest demand on the market show the most impressive developments: 1-door refrigerators, 1-door freezers, counter refrigerators.*
- *The improvement in best available technology, triggered by the entry into force of the Energy Labelling and Ecodesign regulations, is on-going.*
- *The only category not included in the scope of the energy label, refrigerator-freezers, showed no development.*
- *ProCold was the only impartial operator checking product data: when discrepancies*

Year	# models	# models incl. similar models	# manufacturers	# categories
Feb. 2015	85	187	11	11
Jan. 2018	170	291	30	16

Table 1 - Manufacturers carried out strong efforts to get on the Topten lists or to reach best rankings within the lists.

At the end of the ProCold project, 30 brands are able to produce

170

models of super efficient plugged-in cold cabinets

No. of Storage Refrigeration Appliances in Topten Database 2015-2018 by Energy Class

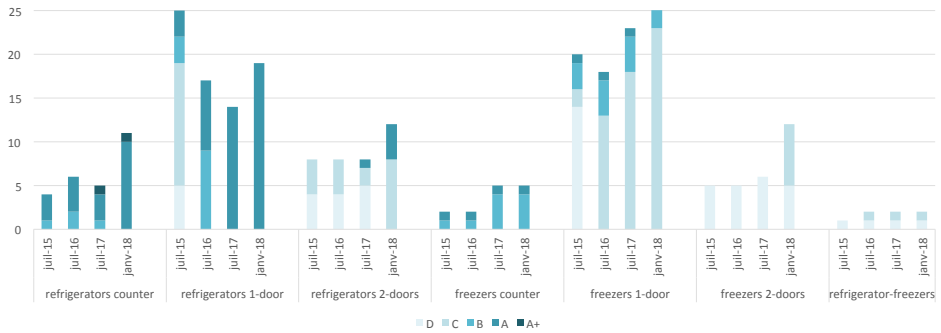


Illustration 4 - Evolution of the number storage refrigeration appliances in the Topten database 2015 - 2018

between various sources of information were found, manufacturers were notified and corrective actions were implemented (for 8 cabinets, the interpretation and calculation from data measured during standardised tests were corrected; hence the energy label was corrected as well as the information on the manufacturers' website). In that sense, ProCold improved the effectiveness of the labelling regulation by increasing the validity of the declared data.

Market development for commercial cold cabinets

Illustration 5 shows the market development for the 6 display refrigeration categories from the start to the end of the ProCold project (vertical display freezers are separated by size).

Obtaining standardised product data for commercial cabinets was and continues to be difficult due to the delays in finalising the regulation.

- *Availability of product data increased when the adoption of the regulation seemed imminent in 2016, because manufacturers were willing to test their products according to the official EN (draft) Standards and to deliver data to ProCold.*
- *When the regulation was postponed, for fear of having to re-test their products[3] according to a future regulation that could be different from the drafts, many manufacturers returned to their own former energy consumption measurement protocols – that cannot be compared one with another.*
- *As a major success, ProCold has managed to establish good contacts with key manufacturers of commercial cabinets who delivered standardised product data in order to be listed on Topten (test reports strongly suggest that most tests were explicitly done in order to be able to be listed on the Topten website).*
- *In the framework of the ProCold project, Switzerland and Austria developed important rebate programmes which were one of the main incentives for manufacturers to invest in the additional tests according to official (draft) standards.*
- *Product groups with the highest demand on the market show the most impressive developments: beverage coolers, ice-cream freezers, chest supermarket freezers. The first model with a (draft) Energy Efficiency Index < 10 (beverage cooler) entered the market in January 2018.* ■

3 The tests for all products in a given product category can take several months for large manufacturers and involve significant time and monetary resources.

No. of Refrigerated Display Cabinets in Topten Database 2015-2018 by draft EEI*

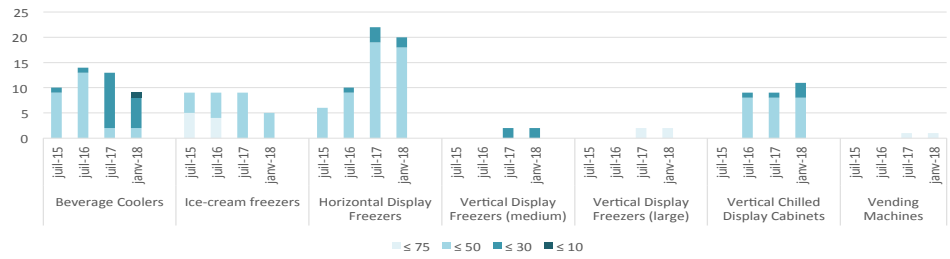


Illustration 5 - Evolution of the number refrigerated display cabinets in the Topten database 2015 - 2018

* Since Refrigerated Display Cabinets are not regulated, in order to use an indicator that all stakeholders would agree upon, Topten ranked cabinets according to their Energy Efficiency Index (EEI) as defined in a draft regulation text proposed by the European Commission. The lower the index, the more energy efficient the cabinet.

No. of Storage Refrigeration 1-door by Energy Class

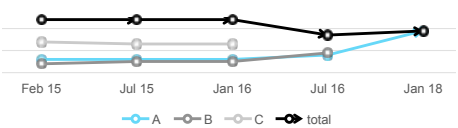


Illustration 6 - Number and Energy class of 1-door storage refrigerators in the Topten database 2015 - 2018

Horizontal Display Freezers by EEI

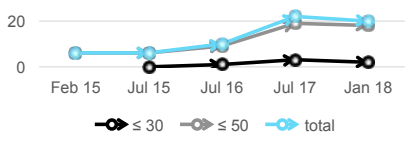


Illustration 7 - Number and (draft) Energy efficiency index of horizontal display freezers in the Topten database 2015 - 2018

Illustration 8 - Example of the Liebherr manufacturer showing its ProCold winning product on its booth at EuroShop

2 – PROCOLD PRODUCT COMPETITION

The ProCold product competition was meant to:

- *Enable a fair comparison based on defined measurement standards and tests in recognised laboratories.*
- *Encourage early uptake of new and upcoming Ecodesign and Energy Labelling regulations.*
- *Motivate manufacturers and increase the number of efficient models in the Topten lists and generally drive the market towards improved energy efficiency.*

The ProCold team issued the competition rules in January 2016 for 5 product categories. Manufacturers had 8 months to finalise the development of their super efficient products. Applications were analysed and best models were tested at selected laboratories. An awarding ceremony was organised at the largest international retail fair in Europe, EuroShop, in March 2017.

Thanks to their outstanding energy performance, the winners of the ProCold Product Competition 2017 are:

Product Category	Winners
Vertical chilled storage cabinets	Gram Superior Plus K 72 G
Beverage coolers	Liebherr FKDPv 4503
Small ice cream freezers	Liebherr GTEP 3302
Vertical supermarket refrigerator cabinets	Carrier Optimer 0948LG R290
Refrigerated glass fronted vending machines	Sielaff GF Robimat XM

Table 2 - Winning models of the ProCold product competition in March 2017

Illustration 9 - The winners of the ProCold product competition – representatives from Carrier, Gram, Liebherr and Sielaff accept their certificate and trophies from organisers of the EU project ProCold.

Illustration 10 - The professional press (here coolingpost.com) covered the ProCold product competition

Winning manufacturers received a customised specific logo for each of the winning model, a certificate and an award.

Illustration 11 - Examples of ProCold award, certificate and customised logo given to each manufacturer of a winning product

The ProCold product competition helped to provide recognition for energy efficient products in professional and commercial refrigeration. It also set a benchmark in several product categories to encourage manufacturers to develop even more efficient products in the future. **Winning products across product categories demonstrate that manufacturers are willing and able to produce very energy efficient cooling products, that those energy efficient products with natural refrigerants are available today, providing significant energy and cost savings to users.** ■

3 – LESSONS LEARNT FROM TESTING AND MEASURING ENERGY CONSUMPTION UNDER STANDARDISED AND UNDER "REAL-LIFE" CONDITIONS

The ProCold project carried out products' tests in laboratories, for the competition and beyond, but also two measurements projects in situ. Both activities allowed gaining knowledge on specific issues. More information and dedicated technical reports can be found at www.topten.eu/ pro-cold.

Picture	Type of commercial cabinet measured	Measured energy consumption (kWh/year)
	Vertical supermarket refrigerator cabinet, open (used for selling beverages)	8 710
	Vertical supermarket refrigerator cabinet, open (used for selling beverages)	2 428
	Horizontal supermarket refrigerator cabinet, open	3 782
	Horizontal supermarket freezer-refrigerator cabinet, with glass lid	2 996
	Horizontal supermarket freezer-refrigerator cabinet, with glass lid (used for selling ice cream)	1 151
	Ice-cream freezer, with glass lid	4 943
	Ice-cream freezer, with glass lid	1 290
	Ice-cream freezer, with glass lid	836
	Ice-cream freezer, with glass lid	698

Table 3 - Measurement project under real-life conditions in Switzerland

AWARENESS RAISING: PLUGGED-IN EQUIPMENT DO CONSUME A LOT OF ENERGY!

Users do not realise how much electricity and money is used by professional and commercial equipment installed in their premises. Simple and pragmatic measurements can help raise awareness. In Switzerland, products were measured over the period of one week with data loggers (power, energy consumption and temperature inside and outside of appliance). Given the results, shops owners started to ask their suppliers for information on the equipment' energy consumption and type of refrigerant used.

AWARENESS RAISING – POTENTIAL ENERGY SAVINGS ARE VERY LARGE!

In Italy, thanks to the cooperation of the manufacturer SAGI and the retailer Gruppo Gabrielli, it was possible to measure energy consumption of storage refrigerators and freezers installed in a canteen and in a kitchen preparing deli dishes at a retail store. Measurements were undertaken before and after the replacement of old cabinets by new models. The data collected indicate a high energy saving potential provided by the new efficient equipment: 60% for the storage freezer, ca. 70% for the refrigerated cabinets.

STORAGE CABINETS: GOOD CORRELATION BETWEEN THE ACTUAL CONSUMPTION AND THE ONE DECLARED ACCORDING TO THE STANDARD

The results of the measurement campaign in Italy showed that the "real life" average daily consumption measured was lower than the one declared on the label (according to the standardised measurement protocol). However this difference in consumption was expected, in the proportion measured, because the ambient temperature and relative humidity conditions were more favourable than those of the standard protocol, making it easier for the cabinet to reach the targeted storage temperature. This confirms various studies on energy consumption's variation depending on ambient conditions and indicates that the estimated consumption reported on the label is a reliable basis to compare models.

CONTRIBUTION TO FUTURE STANDARDISATION AND REGULATION PROCESSES

ProCold undertook 13 tests of products in selected laboratories, for the competition and beyond, which raised questions on the following topics:

- *The calculation of **net volume** and **total display areas (TDA)** needs to be unambiguously defined, especially since it has a substantial influence on the Energy Efficiency Index (EEI) calculation.*
- *Contrarily to professional cold products, there is a risk that **commercial cabinets** show much higher energy consumption in real settings than in artificial test settings. Test standards should require cabinets to maintain performance in **changing environmental conditions** and/or define a maximum number of changes of controls within which expected performance has to be achieved.*
- *Because it is expected that **software** will likely play an important role in future generation of refrigeration equipment, test standards and regulations should take this into account, e.g. by defining unambiguous "default" settings for testing.*
- *Without surprise, whatever the testing protocol considered, the **use of solid doors compared to glass doors, show an improvement of the energy consumption of more than 40%**.*
- *The measurement campaigns revealed a need to assess whether climate class 4 correctly represents the average climatic conditions in the environments where the equipment is installed, and to evaluate the relationship between changes in indoor thermo-hygrometric conditions and energy consumption.*
- *Independent testing of same products according to different test standards is necessary to understand implications for users and policy making.*
  - *For example, the actual energy consumption of commercial beverage coolers may be significantly underestimated by the standard proposed for the future Ecodesign regulation .*
  - *The ProCold tests involving standards for domestic use and for professional use, show that **significant improvement potentials are still present in commercial and professional refrigeration cabinets. The major differences in energy consumption cannot be explained by the different test standards.** Instead, they seem to stem primarily from the fact that commercial appliances have major unexploited efficiency potentials compared to household refrigeration equipment for which an Energy Label and Ecodesign requirements have been in effect for a while.*
  - *Static cabinets can achieve a high **energy efficiency compared to forced-air cabinets,** while meeting temperature performance requirements. They seem particularly suitable for use-patterns during which the extra opening of the drawers does not constitute a significant burden (e.g. when the freezer is only opened moderately). For the future, it is recommended to include static cabinets in the Ecodesign and Energy Labelling regulations to allow for direct comparison of energy performance.*

MORE INDEPENDENT TESTING IS NEEDED TO LEVEL THE PLAYING FIELD

The ProCold tests exemplified the value of independent testing of energy performance. Two of the tested cabinets in the framework of the competition were either not meeting performance requirements or had significantly higher EEI compared to reported energy performance. In addition, manufacturers repeatedly underlined the need for independent testing and market surveillance authorities' testing in a regulative framework such as the European one, relying on self-declarations. This is needed to guarantee a fair competition on the market. ■

Storage refrigerators and freezers:

60% to 70%

energy can be saved by changing for new efficient equipment

4 – PROCOLD BASICS 2: WORKING WITH ALL STAKEHOLDERS

Using as a basis the work done on the products themselves (identifying the most efficient models, checking product data, testing products, organising a competition…), the ProCold team worked directly with stakeholders to raise their awareness and engage them in concrete actions. The idea was to **target in priority the stakeholders whose decisions could have a leverage effect, motivate other stakeholders, and trigger important savings.**

ProCold reached

1195

stakeholders with customised information, presenting to each of them the benefits of energy efficient models

The project partners at the national and at the European levels reached 1 195 organisations and institutions that received the ProCold information on energy efficient refrigerated cabinets and tools customised to their needs and interests:

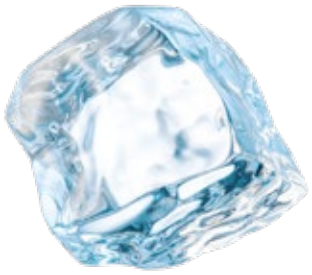
- *Market feedback and policy recommendations were provided to policy makers on energy performances of available products, on technical issues relating to standardisation, and regulations.*
- *Efficient cooling was underlined as a hot sales argument for manufacturers and suppliers who benefit from the trend towards energy efficiency, gain competitive advantage, get their best products listed on topten.eu.*
- *The argument of meeting environmental targets and bringing more profit to their customers by reducing their electricity costs was proposed to the food and beverage industry.*
- *Reducing their electricity costs, meeting environmental targets and distinguishing their brands was demonstrated to retailers and large direct users.*
- *Acting in an exemplary way, cost reductions and meeting environmental targets were emphasised to professional buyers.*
- *Reduced electricity costs, protecting the environment, and operating more economically was emphasised to service companies working for catering industries, hotels, offices, etc.*

Table 4 shows the types of stakeholders reached by the ProCold project. In order to promote energy efficient cabinets and natural refrigerants, the objective was to increase their skills, capabilities and competencies. Information was disseminated to qualified audience with the goal to trigger actions supporting energy efficiency, such as the labelling of Topten products, the adoption of procurement criteria according to ProCold specification, the use of more natural refrigerants, favouring closed cabinets, etc.

Illustration 12 - Main buyer groups for products in scope (plugged-in professional refrigeration)
Source: Lot 1 and Lot 12 preparatory studies.

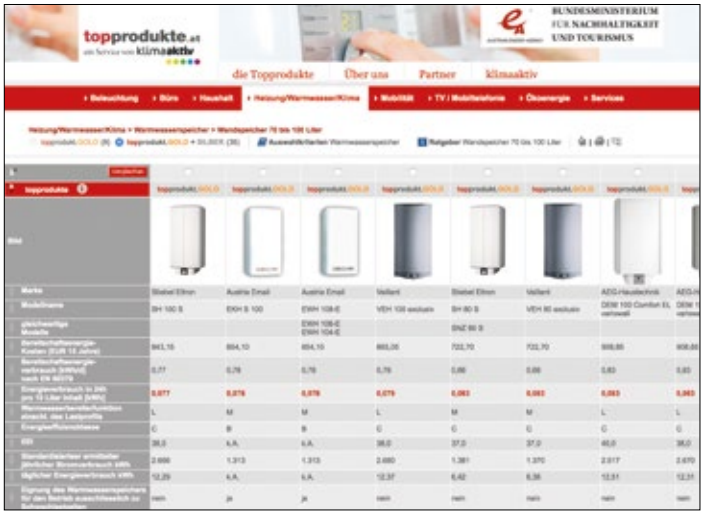
	Full exchange with the organisation	Info received by the person in charge	All together
Manufacturers	218	69	287
Food and beverage industry	104	73	177
Retailers and direct users	118	99	217
Public authorities	117	65	182
Service companies	45	28	73
Media, NGO, tech. associations, etc.	184	75	259
Total	786	409	1195

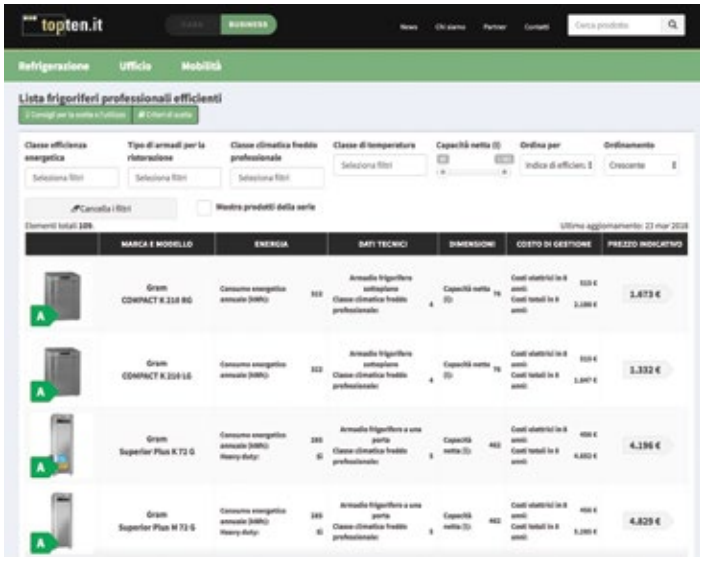
Table 4 - Overview of the types of organisations reached by the ProCold project

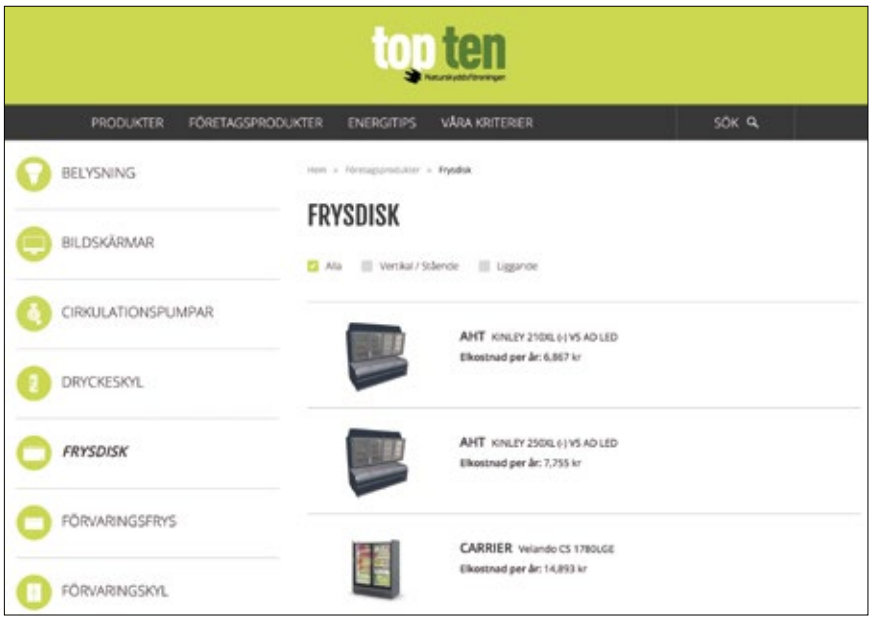


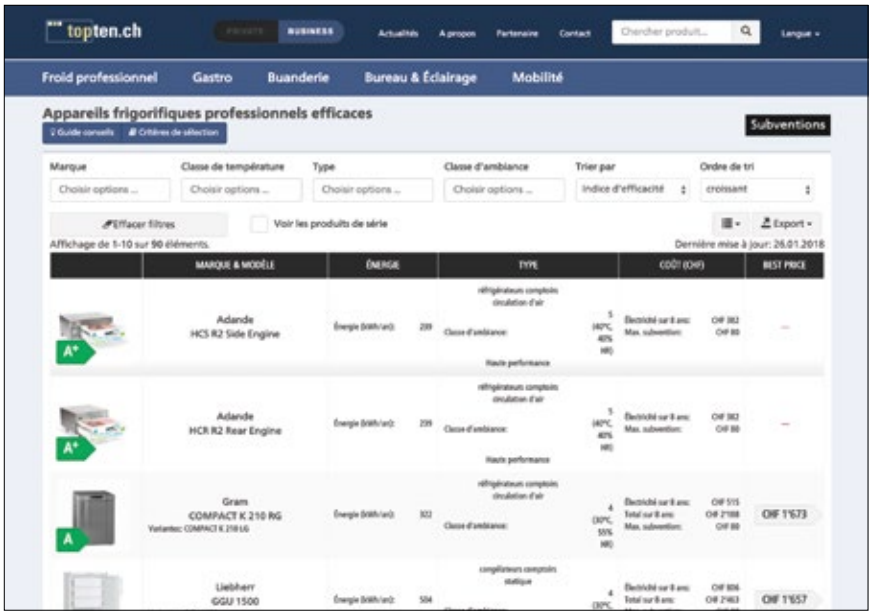
Customised ProCold information packs were prepared to contact and engage a dialogue with each type of stakeholder. All documents can be downloaded from www.topten.eu/ pro-cold.

Illustration 13 - Screenshots of the 8 national Topten websites, displaying information in national language









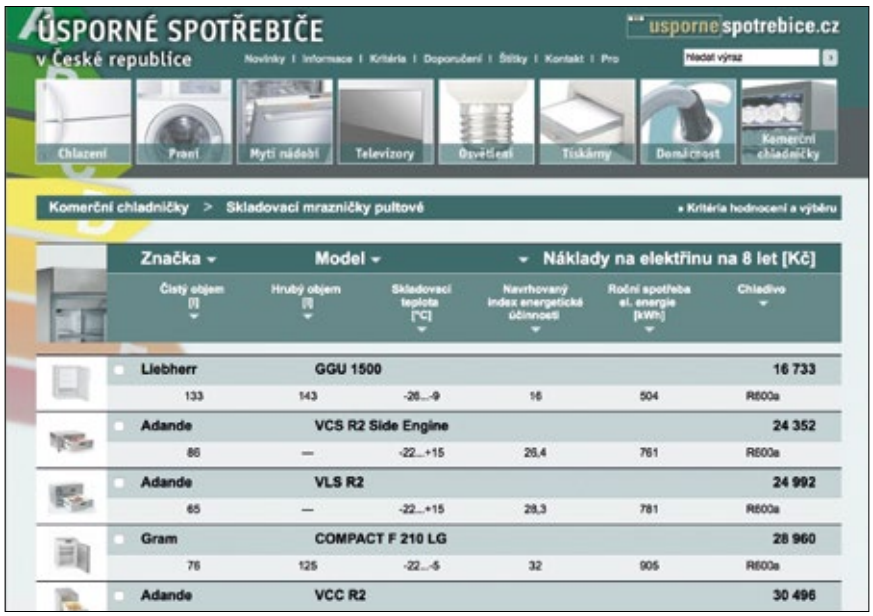


Illustration 14 - Example of the ProCold brochure presenting the main arguments in favour of energy efficiency to retailers.

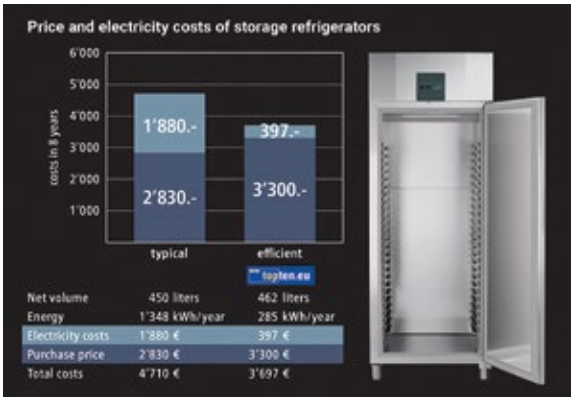


Illustration 15 - Example of communication support presenting price and electricity costs for storage refrigerators

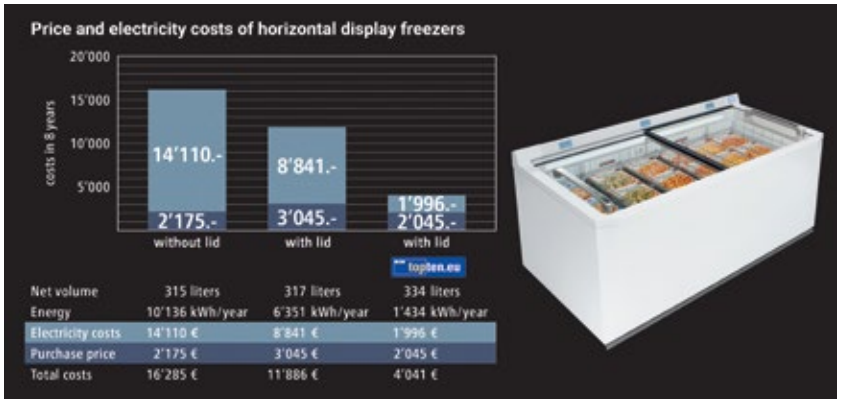


Illustration 16 - Example of communication support presenting price and electricity costs for horizontal display freezers.

Country selection	EU			
Professional display cabinets				
Calculation settings				
Electricity tariff	0,2	€/kWh	Info: 0,20	
CO2 emission factor	0,44	kg CO_2/kWh	Info: "Add country specific value here"	
Select product type				
	Ice cream freezers			
input product data				
Net volume or total display area	281	L / m²		
Annual energy consumption (AEC = TEC * 365)	1817	kWh/a		
Number of products in same category	1	[-]		
Service life	8	years		
Your product (price)	2000	€		
Topten product (price)	2400	€		
Comparison to topten product(s) over life time				
	Energy consumption	purchase price - product(s)	Energy costs	CO2 emissions
Your product(s)	14536 kWh	2000 €	2907 €	6,95 t
Topten product(s)	5202 kWh	2400 €	1040 €	2,84 t
Total savings	**9334 kWh**		**1467 €**	**4,11 t**

Illustration 17 - ProCold calculator, input fields

Procurement guidelines were produced for front-runner public procurers to help them easily find green products. The criteria can be inserted directly into tendering documents and are available in six languages.

The **ProCold calculator** was designed as an Excel based tool able to calculate the monetary and CO_2 savings that can be expected from the use of efficient professional and commercial cold products.

Total energy costs - topten product(s) vs. actual products(s)

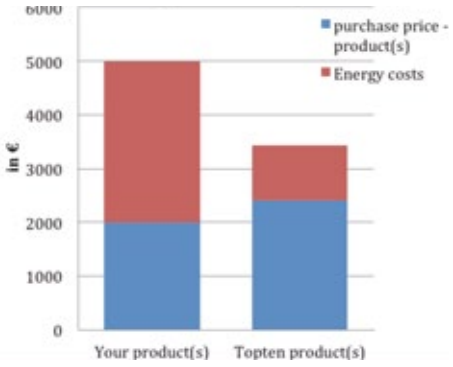


Illustration 18 - ProCold calculator, result fields comparing the user's product (left) with a Topten listed product (right)

These concrete numbers can support the goals of Corporate Social Responsibility (CSR) policies. The tool compares the performance of the user´s product with a similar topten.eu listed product. Potential buyers can insert the purchase price of the products, which allows a calculation of the total life-time costs of the cabinets.

The ProCold and Topten logos were also proposed to stakeholders willing to brand their activities. Mostly manufacturers were interested by this offer.

Illustration 19 - ArcaBoa model displaying Topten/ ProCold sticker

Illustration 20 - Email signature using the specific ProCold competition logo for awarded products

29

ProCold press releases led to more than 150 publications in the professional press
25 ProCold participations in national and international fairs and conferences

The ProCold team was also active in targeting the **professional press** and participating in more than 25 **national and international fairs and conferences** to present the project and reach further stakeholders. 29 press releases were issued (for the launch of the project, the entry into force of the energy label, the ProCold competition launch and results, the achievements at the end of the project) generating over 150 publications. Video spots were produced and social networks were also used.


ACTUS FRANCE 9

FROID PROFESSIONNEL

L'étiquette génératrice de bonne énergie

Vite !

AMENDEMENT

Le Sénat retoque le bio en collectivité

Illustration 21 - Newspaper article from France


A come Ambizione

Illustration 22 - A printed article in an Italian magazine

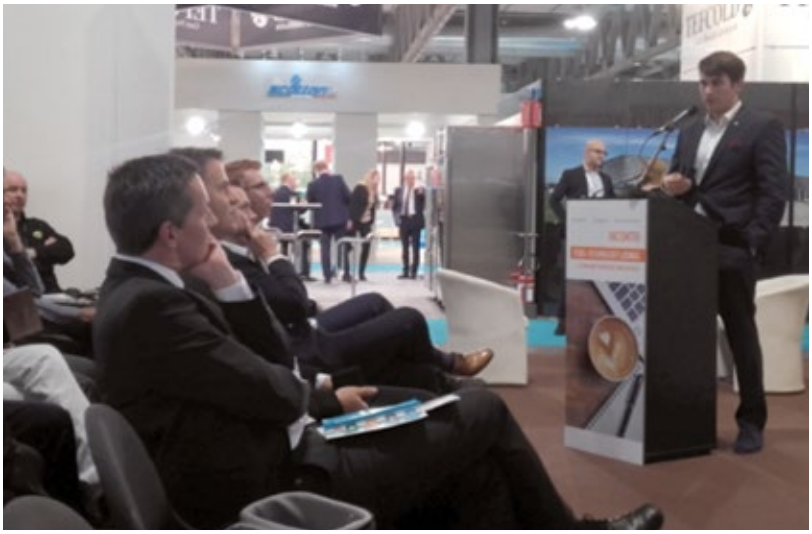


Illustration 23 - Final project presentation at the HOST fair (Equipment, coffee and food hospitality international exhibition), in October 2017, in Milan, at an event co-organised by ProCold and EFCEM.

Switzerland has designed a **rebate programme for energy efficient professional and commercial plugged-in cabinets,** based on the ProCold project and the corresponding Topten product lists.

A maximum of 25% of the purchase price of all the models on the Topten list could be subsided, i.e. with 80 to 2 500 CHF (68 to 2 120 €). The preliminary evaluation of the 3 irst years of the programme is very positive:

- ***The rebate was a great motivator for manufacturers to deliver quality and comparable product data.***
- ***6 000 models benefited from the rebate with a subsidy of ≈1.6 M€***
- ***The electricity savings reached ≈ 55 millions of kWh***
- ***The cost of a saved kWh is nearly 3 Eurocents compared to the average kWh price of around 20 Eurocents.***

A new three-year rebate programme started in Switzerland in January 2018. Austria started their own two-year rebate programme after the model of the Swiss ProCold rebate programme in January 2017 and has successfully supported the purchase of more than 1 000 super efficient products by January 2018.

In Italy, the ProCold selection criteria are being used by public administrations for their procurement of professional cold appliances. At the local level, the Association of the Italian municipalities in the Lombardy region has already made the use of super energy efficient models – according to the ProCold definition – mandatory in their call for tenders. At the national level, it is expected that the Ministry of environment will soon approve a new decree on similar minimum environmental performance for catering in public institutions, that will concern all types of public buyers.

5- PROCOLD POLICY RECOMMENDATIONS

Thanks to its work on products and the feedback it could gather from a variety of stakeholders, the ProCold team elaborated a number of policy recommendations and had the occasion to present them to the relevant services of the European Commission and several national authorities.

The context, justification and detail of each of them are available in the dedicated Policy recommendation reports that can be downloaded from www.topten.eu/pro-cold.

ADAPTING REGULATIONS TO THE B2B CONTEXT

In order to help market players to implement the EU Labelling and Ecodesign regulations, public authorities can provide support especially by:

- *Proactively communicate about existing and coming EU energy labels and rules to eliminate uncertainties regarding test methods and scope of the regulations*
- *Tackle some shortcomings of the regulation in the next revision:*
  - *Eliminate ambiguities in the scope to cover the widest possible variety of products, as clearly as possible (e.g. provide a definition of "food processing" and "thawing").*
  - *Adapt the legal text to match with B2B market conditions: oblige showing the energy label at fairs, on catalogues and on-line, even when the price or energy information is not indicated.*

RECOMMENDATIONS FOR THE UPCOMING REVIEW OF THE PROFESSIONAL REFRIGERATED STORAGE CABINETS' REGULATIONS

- *Introduce stricter Ecodesign minimum energy performance requirements to mitigate increasing electricity consumption from this sector (exceptions could be planned for special product categories if absolutely necessary).*
- *Include heavy-duty cabinets in the scope of Ecodesign minimum requirements.*
- *Include refrigerator-freezers in the scope of the energy label.*
- *Include static-air storage cabinets in the revision of the Household Refrigeration Ecodesign regulation together with commercial wine coolers and minibars.*
- *Showcase products using natural refrigerants on the EU energy label.*
- *Mandatory labelling online, in print and at trade fairs without limitation to when price and energy information is also displayed (as described above).*
- *Include ice-machines in the scope of Ecodesign and Energy labelling regulations.*
- *Include a mandatory declaration of energy data for remote systems.*
- *Encourage CEN/CENELEC to eliminate grey areas in definitions and test standards (example: placement of m-packages during the testing for energy consumption now that the area behind pillars is officially part of the net volume) and to proactively communicate about existing and coming EU energy labels and rules.*

RECOMMENDATIONS FOR THE FORESEEN LEGISLATION ON COMMERCIAL REFRIGERATED DISPLAY CABINETS

According to ProCold calculations based on JRC estimates, the delay in regulating this sector has led to annual savings lost of 34 TWh by 2024. A swift resumption of the regulation process is of high importance. ProCold recommends the following aspects to be included in the new regulation to ensure its efficiency.

- *It is very good that the energy label should reserve the two top classes (B and A) for future innovation.*
- *The energy efficiency index (EEI) formula should be transparent, avoid correction factors and take into account only minimal product segmentation.*
- *A new study to provide new M and N values for EEI calculation should be commissioned (some beverage coolers already reach EEI of < 10).*
- *The second tier of minimum performance requirements should trigger significant market development, banning all open freezers and demanding that all open refrigerators be top-efficient according to today's standard.*
- *Reconsider whether total display area (TDA) should be the parameter to calculate the EEI.*
- *Detail how to deal with special categories like roll-in cabinets, semi-vertical cabinets and serve-over counters. ProCold strongly recommends that MEPS are less tight for these categories but that they are based on the same EEI calculations as the energy label instead of further segmentation in the EEI calculation.*
- *Stipulate consistent instructions on testing products' series: a controversial issue for testing and declaring energy data is the variety of different possible configurations for each model. If each configuration cannot be tested, the regulation should stipulate a general rule for worst-case testing or adjustment calculations where possible.* ■

6 – QUANTIFIED PROCOLD ENERGY SAVINGS

ENERGY SAVING HYPOTHESIS AT THE START OF THE PROCOLD PROJECT

The project aimed to increase the sales of best available technology (BAT) models. The impact should be stronger in the eight participating countries but should also affect the total European market because the targeted actors operate internationally. At the beginning of the project, the ProCold team expected that at least additional 0.4% of sales would be BAT models chosen over average models thanks to the project's activities (at least 0,8% in participating countries and 0.15% in other European countries).

The eight participating countries (Austria, Czech Republic, France, Germany, Italy, Portugal, Sweden and Switzerland) account for 49% of EU28+CH population[1]. A proportional distribution of the EU sales to the countries' population was assumed.

Primary energy savings of 276 GWh/year during the lifetime of products (8 to 10 years) were expected to be triggered by the project. This estimate and its underlying additional sales percentages were based on sales data from EC's preparatory studies and labelling formulas according EU policy documents[2] available at the time of the calculation, i.e. May 2014, and test standards of the same time. Final post-project calculations reflect the current EU policy documents and test standards (as of February 2018).

ENERGY SAVING RESULTS AT THE END OF THE PROCOLD PROJECT

Using the same consistent hypothesis as above but using updated values for efficient models' performances, Table 5 shows the primary energy savings in GWh triggered by the ProCold actions within one year.

The ProCold budget was 1.18 M€. Given the primary energy savings triggered within one year shown in table 5, this results in **250.6 GWh/year per million €** over the operation phase of the products.

Table 6 shows a summary of the results for BAT sales and energy savings triggered by ProCold, comparing the projected data from 2014 and the actual results calculated at the end of the project.■

[1] Eurostat 2013

[2] Preparatory study update (LOT 12), Final report, Ecodesign for Commercial Refrigeration, JRC, 2014. Preparatory study (LOT 1), Final report, Refrigerating and freezing equipment, BIO IS, 2011. Preparatory study (LOT 12), Final report, Commercial refrigerators and freezers, BIO IS, 2007.

Product category	Electricity savings triggered within project duration calculated over the operation phase of the product	Primary energy savings triggered within project duration calculated over the operation phase of the product	Primary energy savings triggered within one year (calculated over the operation phase of the product)
	GWh	GWh	GWh/year
Refrigerated display cabinets	96	241	80
Beverage coolers	165	414	138
Ice cream freezers	20	50	17
Refrigerated vending machines	4	11	4
Refrigerated storage cabinets	58	144	48
Minibars	8	19	6
Wine storage appliances	4	9	3
Total	355	888	296

Table 5 - Overview of calculated primary energy savings triggered by ProCold (conversion from electric energy to primary energy with default coefficient of 2.5)

	# BAT sales triggered by the project (units)	Energy savings thanks to additional BAT sales (GWh)	Primary energy savings triggered within project duration (GWh)	Primary energy savings triggered within one year (GWh)
Projected 2014	31 283	331	828	276
Realised 2018	37 573	355	888	296

Table 6 - Projected and realised impacts of the ProCold project

Notes

Notes

“The European initiative ProCold has successfully implemented its goals: The market share of efficient professional cold appliances was improved. The initiative also raised awareness on the topics of energy efficiency and natural refrigerants for professional cold appliances.”

BERNHARD GUT, CITY OF LUZERN,
SUMMARIZING THE PROCOLD RESULTS

“Within the framework of a B2B sector such as the one of the professional refrigerators, ProCold analysis represents a valuable source of information on technical feature of products, market penetration of energy efficient ones, areas of potential improvement for the policy. This analysis could be used e.g. as background information to prepare the review of the Ecodesign and Energy Labelling measures for professional refrigerators.”

DG GROW UNDERLINING THE IMPORTANCE
OF PROCOLD´S WORK
FOR POLICY DEVELOPMENT

“…vending machine manufacturers can still submit their machines to be ranked on the www.topten.eu website…EVA would like to see manufacturers taking advantage of this platform, submitting their machines and demonstrating their efforts in energy saving technologies.”

VENDING EUROPE ENCOURAGING ITS MEMBERS
TO SUBMIT PRODUCTS FOR TOPTEN.EU.

“If you are uncertain which product you should choose for your cooling system, the international initivatie ProCold has the goal of helping procurers to select professional plugged-in cold products.”

GREGOR SINNHUBER, AUSTRIAN CONSULTANT,
RECOMMENDING PROCUREMENT
BASED ON PROCOLD CRITERIA

“The ProCold project together with the Swiss Agency for Energy Efficiency S.A.F.E supported Swiss businesses in reducing electricity use for refrigeration. Their communications facilitated the introduction of the first energy label for professional cold equipment. We are pleased that Swiss initiatives like the rebate programme for energy efficient commercial refrigerators and freezers spread to other countries during the ProCold project.”

KURT BISANG, HEAD OF APPLIANCES
AND COMPETITIVE TENDERS SECTION,
SWISS FEDERAL OFFICE OF ENERGY SFOE.
THE SWISS FEDERAL OFFICE OF ENERGY OVERSEES
ENERGY EFFICIENCY REGULATION,
OFFERS EXPERT INFORMATION AND OPERATES
THE PROKILOWATT PROGRAMME
WHICH PROVIDES FINANCIAL CONTRIBUTIONS
FOR THE REPLACEMENT OF INEFFICIENT TECHNOLOGIES.

The ProCold project was led by energy specialists and environmental NGOs and consisted of the following partners:

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

AUSTRIAN ENERGY AGENCY

Bush Energie Gmbh

guidetopten.fr

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

POLITECNICO DI MILANO

Quercus

SEVEn

Swedish Society for Nature Conservation

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