

Project Number: 649293

Project Acronym: ProCold

Project title: Empowering stakeholders to deliver highly energy efficient professional cold products

Periodic Technical Report

Part B

Period covered by the report: from 01/08/2016 to 31/01/2018

Periodic report: 3rd

Project website: www.topten.eu/procold and www.pro-cold.eu

1. Explanation of the work carried out by the beneficiaries and overview of the progress

1.1 Objectives

The ProCold project targeted the professional plug-in cold products, aimed to refrigerate or cool foodstuff and beverages. It aimed to support the most efficient models (at the same time using climate friendly refrigerants) by their identification and recognition, and by educating both the supply and demand side of the market. The general objective of the project was to empower private stakeholders and public authorities in adapting and enforcing EU and national energy efficiency policies in the sector of professional cold products.

A specific objective was to ensure that more energy efficient professional cold products enter the EU market and increase their market shares, thereby contributing to the EU's energy efficiency goals and policies.

Plug-in refrigerated display cabinets	Ice-cream freezers	Beverage coolers	Minibars	Refrigerated vending machines	Wine coolers	Refrigerated storage cabinets
						

Table 1: Professional cold equipment

The **product groups** concerned related to products for cooling, refrigerating or freezing foodstuff and drinks on professional premises – from public buildings, to hotels, retailers, and canteens. These represent significant energy consumption (at least 30,000 GWh/year¹), important differences exist between various models of the same product category (saving potentials of 50-60%, see below), but, due to lack of clear regulation and lack of information, the potential for more energy efficient models remains largely untapped.

The **specific legislation** concerned is the one regulating Ecodesign requirements (minimum energy performance standards and mandatory product information) and energy labelling, as well as public procurement activities (notably Article 6 of the Energy Efficiency Directive and its transposition in national laws). The project benefited from a relatively good timing because new energy efficiency legislation (Ecodesign and energy labelling) regarding most of these product groups were being decided. However, the delay of Lot 12 regulations generated uncertainties for economic operators, which put a dampener on energy efficiency developments.

Equipment	Energy Labelling and Ecodesign legislation	Date when label / product information is mandatory
Minibars (and wine coolers intended for households but used in the Professional sector)	In force	Mandatory
Refrigerated storage cabinets (Lot 1)	In force	Mandatory (since 1 st July 2016)
Refrigerated display cabinets and counters, beverage coolers, ice-cream freezers, vending machines (Lot 12)	Drafts expected by the end of 2018 (whereas at the beginning of the project they were expected in 2016), entering force expected in 2020	Expected for 2020

Table 2: Overview on energy efficiency legislation covering the product groups in scope (as of January 2018)

¹ EU stock consumption data from Ecodesign legislation preparatory studies (data is for 2006 or 2008 and incomplete for some product groups, therefore real energy consumption can be expected to be well over 30,000 GWh/year).

Target groups of this project were threefold: empowering *public authorities* in implementing effective policies on energy efficiency of professional cold products; motivating product *manufacturers and suppliers* in delivering more efficient models to the market; and working with the *food industry, retailers, building operators, and other stakeholders* in demanding and procuring more efficient professional cold products.

Achievements during the reporting period are explained in each of the WPs below.

1.2 Explanation of the work carried per WP

1.2.1 WP1 – Administration and project management

WP Leader – ADEME

1.2.1.1 Activity description

During this reporting period, within WP1 a number of activities were undertaken by the coordinator in order to ensure a successful project and a smooth cooperation between partners:

- Maintenance of two internal systems to share information between partners: a secured site managed by ADEME where to share important documents, working documents and final deliverables and a dedicated directory on Google Drive allowing to report progress in the various WPs and logbooks to understand who is managing which contacts at which level.
- Internal administrative management including contract preparation for each partner and interim payment.
- Internal presentations of the project.
- Continued interaction with the EASME: understanding the new H2020 rules and conveying questions from partners, dealing with the Sygma portal to upload deliverables work on the interim report and on the contract amendments (with still some difficulties, see Chapter 5).
- Organisation of 3 project meetings (in Gothenburg, Luxemburg and Milano) together with the hosting partner: agenda elaboration, team and discussion leading during the meetings, overview presentation checking out the work programme against the timeline, elaboration of the minutes including an action list.
- Participation in the ProCold product competition award ceremony at the Euroshop fair (see WP5 below) in March 2017. ADEME hold a presentation.
- Participation in a meeting at GRAM's and Liebherr's headquarters to exchange about technical developments (see WP3 below) in August 2017.
- Participation in the ProCold event at the HOST fair in Milano in October 2017.
- Strict quality control of all the deliverables, which are, discussed upstream with relevant WP leaders at the time of their planning or when thinking of the structure of their monitoring, then thoroughly red and commented before they were considered as finalised.
- Final report coordination and preparation including grant agreement amendments to satisfy specific needs from specific partners.
- Final publishable report coordination and preparation, including involvement of a graphic designer.

1.2.1.2 Support by national teams

National teams were supportive in reacting to the content proposals for meetings, participating in the meetings, in the reporting activities and amendments. There is no specific difficulty to report.

1.2.2 WP2 – Status quo and monitoring of market development

WP Leader –ADEME, in collaboration with Bush Energie

1.2.2.1 Activity description

Reviewing market developments in the top performing segment was a key topic for all ProCold tasks over the whole project duration. Accordingly, this was a focus of work for WP2, updating the product lists, updating the selection criteria when necessary, and assisting national teams in implementing those updates at the national level. Best Available Technology Products (BAT products) were identified in the most relevant categories of commercial and professional cold appliances, published on topten.eu, on national Topten websites, and revised continuously.

1.2.2.1.1 Contacts with manufacturers

In this reporting period, new contacts with manufacturers were established and as more manufacturers started to develop efficient technologies with climate-friendly refrigerants, products from more manufacturers could be included in the lists. Ten updates of the product lists were undertaken between August 2016 and January 2018 (making it 26 updates over the entire ProCold project duration), which involved contacting manufacturers, collecting and checking all necessary information, uploading the products, evaluating the market changes and tightening selection criteria if necessary as well as informing manufacturers and dealers ahead of time. All teams have implemented the changes on their national Topten platforms.

Several manufacturers and dealers also started labelling their Topten products with the Topten logo on their websites, in catalogues and on trade fairs. The introduction of the energy label for professional refrigerated storage cabinets had a positive impact on the market: standardised product data became increasingly available (though it is not yet available for all products). Due to the novelty of the label, some uncertainties remained in our exchanges with manufacturers about the correct interpretation of the test norm and the implementation of the label. To prevent errors and to substantiate the quality of the product data listed on the Topten database, manufacturers continue to supply ProCold with confidential test reports for all professional and commercial appliances that are to be included in the BAT product database. In some cases, small inconsistencies were found and manufacturers were willing and motivated to adapt the product labels not only for the listing on Topten but also on their own websites.

Case study 1²: *for the manufacturer Sagi s.p.a., a mix-up in their database was responsible for the incorrect declaration of the yearly energy consumption on the label of a 2-door storage freezer that they had sent for listing on the Topten database. When notified about the mistake, they immediately corrected the values on the product energy label and uploaded the new label to their own website the same day.*

² Several case studies are presented in this report: to fully inform EASME we have quoted the names of brands but these illustrations should be treated confidentially.

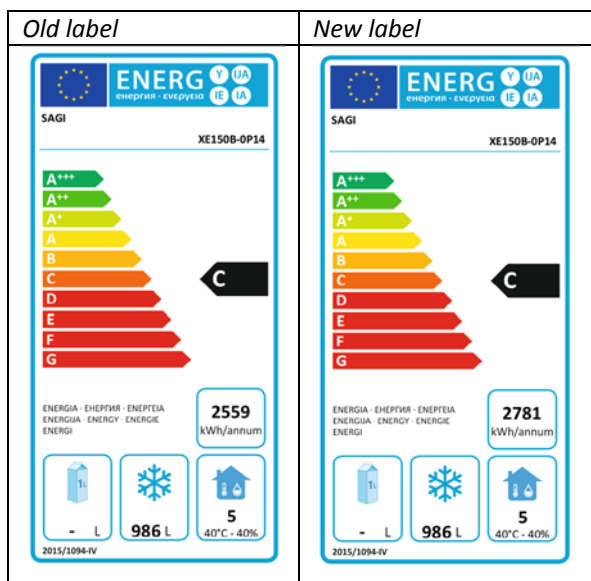


Illustration 1 – Example of a corrected energy label after a notification from Topten

One issue of high concern to all manufacturers is the reliability of declared product data on the European market for commercial and professional refrigeration appliances. Correct product declaration is also the cornerstone of the most important European policy instruments covering products, i.e. the “Energy Labelling” and “Ecodesign” Directives, as well as key for any informed purchase decisions and any platforms comparing products like Topten. ProCold has elaborated a memo on correct product declaration for commercial and professional refrigeration products listed on Topten (see Appendix 1). It describes several constructive channels of communication in case of a conflict between two manufacturers, as well as recommends involvement of manufacturers’ associations and/or surveillance bodies of various European countries. As such, the memo on correct product declaration and national market surveillance is of high importance for manufacturers and buyers to support a fair and transparent European market.

Case study 2: Porkka is a Finnish manufacturer of professional refrigeration equipment that during the first half of the ProCold project was present on the Topten lists, with models ranking among the best ones. Several 1-door refrigerators and freezers were listed on Topten, ranking first, with class A refrigerators and class A and B freezers. Several competitors contacted Topten with the claim that they had tested the Porkka appliances themselves and that the results differed significantly from the declared values. The best class A refrigerator was also submitted for the ProCold competition “Best European Product” in the category vertical chilled storage cabinets. It was tested by an

Kühl- und Tiefkühlschränke
Mit Alpiq InTec energieeffizienter kühlen.

A++ Weltneuheit

A+
A
B
C
D
E
F
G

Förderbeitrag
Klimaschutz
Bundesministerium für Wirtschaft und Klimaschutz
www.bmwi.de

Umweltverträglichkeit und Energieeffizienz waren und sind einer der wichtigsten Faktoren bei der Entwicklung von Porkka Produkten. Mit der Markteinführung der neuesten Generation von energiesparenden Gastronom Kühl- und Tiefkühlschränken wird dies einmal mehr bestätigt.

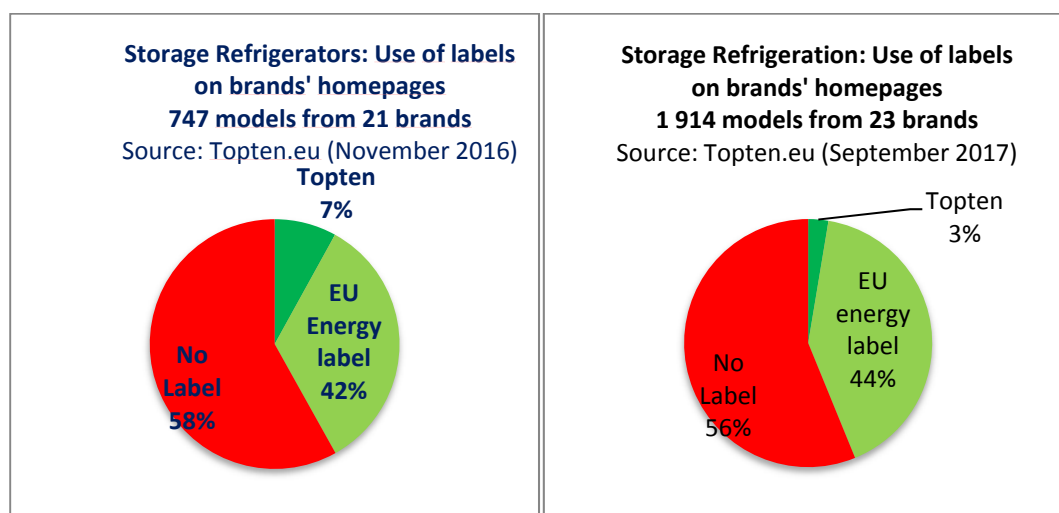
Kurz und bündig

- Förderbeiträge von diversen Städten und Elektroinstallateuren
- Umweltverträglichkeit durch geringeren Energieverbrauch
- Markante Reduktion der Betriebskosten
- Lange Einsatzdauer und kurze Amortisationszeit

independent laboratory, and resulted in a class B classification (the test was repeated by a second independent laboratory with the same results). ProCold asked Porkka for updated test reports for all other Porkka products listed on Topten in order to substantiate the product data. In absence of an answer, all Porkka products were removed from the Topten website. Furthermore, the Swiss dealer of Porkka products, Alpiq, advertised the 1-door refrigerator that had been tested in the context of the ProCold as a class A++ product and as such a world first. When contacted by ProCold about this, Alpiq explained the misdeclaration was a communication mistake on their side and corrected the data.

This case study showcases that during the initial phase of the new energy label, errors still occurred frequently and that the regulation alone does not guarantee the publication of correct standardised product data for professional refrigeration cabinets on the European market. Increased market surveillance and Q&A papers published by CEN/CENELEC about test standards and mandatory labelling would lead to a better implementation.

While the EU 2015/1094 (labelling and standard product information) for professional refrigerated storage cabinets makes the energy label mandatory for all products covered in its scope, a large part of the market is lagging behind with regards to its implementation. **ProCold performed an evaluation in November 2016 (747 products by 21 manufacturers) and September 2017 (1 914 models by 23 manufacturers) on whether product declaration requirements for professional refrigerators and freezers were present online³.** The results showed that in 2016 58% of the appliances were non compliant and that in September 2017 – more than one year after the introduction of the energy label – still 56% of storage refrigeration models did not disclose the energy efficiency class of the product. The results show that market surveillance is strongly needed but the results can also be partly explained by some shortcomings in the regulation that should be tackled in the next revision – such as the adaptation of the regulation to B2B markets as well as clearing-up last ambiguities in the scope.



*EU Label in % incl. Topten models

Illustration 2 – Presence of the label on-line for professional cabinets

Obtaining standardised product data for commercial appliances continues to be extremely challenging because the regulation for these products was not passed and was significantly delayed. When the adoption of the regulation seemed imminent in 2016, manufacturers became

³ http://www.topten.eu/uploads/File/Declaration_Overview_of_Storage_refrigerators.pdf

increasingly willing to test their products according to the official EN standards and to supply the data to ProCold. However, after the regulation was postponed (and several times), many manufacturers argued that with a later implementation of the regulation and long-time discussions with many stakeholders, changes to the test standards during the final adaptation process of the new regulation would become much more likely. Hence, they stopped testing according to official test standards because they did not want to risk having to re-test their entire product range one or two years later – testing all products, even if only one product category, can take several months for large manufacturers and involve significant time and monetary resources.

As a major success, ProCold has managed to establish good contacts with many key manufacturers for commercial cooling appliances that supply standardised product data in order to be listed on Topten. The details in the test reports strongly suggest that most of the tests are explicitly done in order to be included in the Topten database of best products in Europe. On the manufacturers' websites, these efficient products are still declared according to manufacturers' own measurement protocols in order to be comparable to the rest of the manufacturer's product range. The ProCold rebate programmes in Switzerland and Austria (see 1.1.2.2 Support by National Teams) are one of the main motivators for manufacturers of commercial refrigerated display cabinets to invest in the additional tests according to official norms.

Case study 3: *Liebherr is one of the main manufacturers of efficient beverage coolers and ice-cream freezers in Europe and also manufactures supermarket chests and professional storage appliances. After a discussion about details of the test reports for the Topten listed products, we figured out that the data was measured according to their own measurement protocol instead of the official EN. Models that were tested according to both EN 16902 for beverage coolers and Liebherr's own measurement protocols normally show a difference of around only 1 EEI point (in either direction). However, a fair declaration of product data on Topten is only possible if all products are measured according to the same test standards. Liebherr was given a time period to deliver the product data according to official test standards but due to previously scheduled testing they were not able to test the commercial appliances according to the official norm. As a result, 4 ice-cream freezers, 7 beverage coolers and 3 horizontal supermarket freezers were removed from the Topten database on January 2018. Intensive contacts between Liebherr and ProCold have since resulted in multiple beverage coolers and ice-cream freezers scheduled for testing until summer 2018 at Liebherr's and at independent laboratories and in the successful testing and listing in February 2018 of 6 new horizontal supermarket freezers on Topten.*

Contact with manufacturers not only includes the exchange of product information but also discussions about best available technologies, technological developments and test standards. As such, representatives of ProCold were invited and in 2017 visited the R&D and production sites of Carrier in Mainz, Germany, and of Gram in Vojens, Denmark. Carrier focuses on commercial display cabinets and won the ProCold competition (see WP5 below) in the category vertical supermarket refrigerated display cabinet. Gram develops and manufactures highly efficient professional storage cabinets and was the winner of the ProCold competition in the category refrigerated chilled storage cabinets. Both visits provided valuable insights into the technological developments and the manufacturers' positions on existing and future energy efficiency legislation.

1.2.2.1.2 Market development for BAT products

Technological developments are also reflected in the **market development for BAT products** that could be observed in the Topten product list during the course of the ProCold project. Product lists have progressed significantly, which is an indicator of a positive impact of ProCold on the market: there were 85 models from 10 brands at the start of the project, 136 models from 25 brands after the first reporting period, and there are now 170 models from 30 brands. The selection criteria were tightened in July 2016, in July 2017 and once again in November 2017; despite the numerous tightening of selection criteria, the number of BAT products has doubled since the start of the project while the number of participating manufacturers has almost tripled.

For **professional refrigerated storage cabinets**, the introduction of EU regulations triggered a jump in best available technology which is still on-going (see graph below).

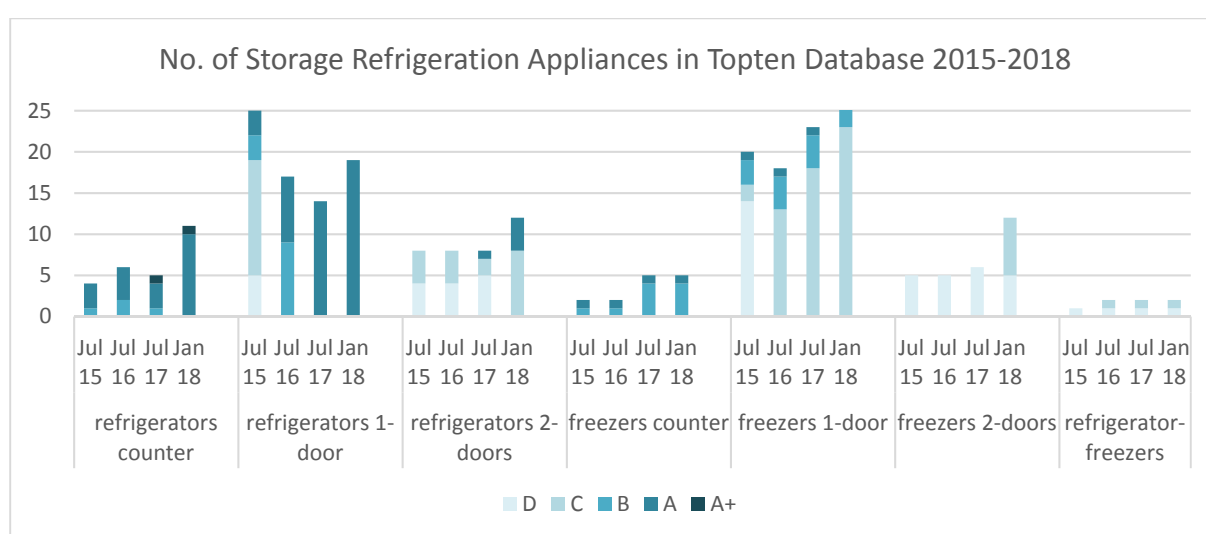


Illustration 3 – Number and energy class of Storage refrigeration appliances in the Topten Data base between 2015 and 2018

Even before the regulations came into force, new models were introduced on the market that reached the best energy efficiency classes A, B and C. Positive developments have occurred especially in the product groups with the highest demand on the market: 1-door refrigerators and 1-door freezers as well as counter refrigerators. The first A+ storage appliance on the market – a storage counter refrigerator by Adande Refrigeration, a manufacturer from the UK – was listed at the beginning of 2017.

The number of storage BAT products was rather stagnant from the start of the ProCold project in 2015 until January 2016 - half a year before the EU labelling and Ecodesign regulations came into effect. Taking into account the time needed from development and testing of new products to their release on the market, it is obvious that the adoption of the regulations in May 2015 triggered significant technological advancements. This development is illustrated by the example of 1-door storage refrigerators in the graph below, and still on-going.

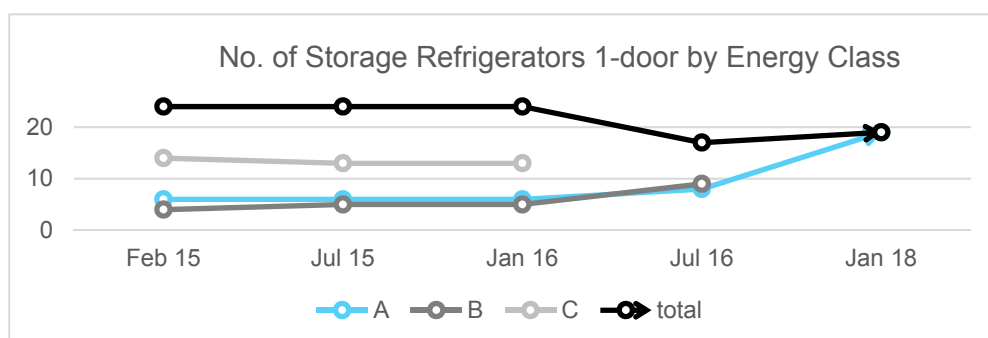


Illustration 4 – Number and energy class of 1-door Storage Refrigerators in the Topten database between 2015 and 2018

For **refrigerator-freezers** – exempt from the label for professional refrigeration appliances – no technological development has taken place. After two products available on the market had been identified, no further models could be listed.

Minibars and wine coolers are covered by the EU regulation EN 1060/2010. As such, standardised energy data is available and a product comparison with regards to energy efficiency and life cycle cost is possible. The Topten database includes three compression type **minibars** (classes A+++ and A++) and two thermoelectric minibars (class A+), and the Topten selection criteria remained unchanged. Possible reasons for the lack of new technologies and products are persisting uncertainties of hotel managers about sensor installations for compressor type minibars and a starting trend to install vending machines on hotel floors instead of individual minibars in each guest room.

The number of efficient models for **wine coolers** has increased and better products have entered the market in the form of 4 A+ wine coolers with multiple temperature zones and 5 A++ wine coolers with one temperature zone. The products listed in the Topten database include models with glass doors and models with solid doors. Both restaurants and households use these appliances. Inclusion of models with both door types into the scope of the new regulation for household refrigeration, as it is currently intended, is strongly advisable, because at the moment only the household appliances are strictly covered by an energy label. Otherwise, it is at the discretion of manufacturers and dealers to apply labelling and Ecodesign requirements or to omit product information for products intended for professional use.

There is not yet much standardised product information available for **commercial refrigerated display cabinets**, as the EU labelling and Ecodesign regulations for this group are still in preparation⁴. The latest working documents are the draft Energy Label and draft Ecodesign Regulation from DG Energy for Refrigerated Commercial Display Cabinets from 2014 (the EC's policy priorities indicate that work on LOT 12 is planned to be resumed in the second half of 2018).

⁴ All references to EEIs in this section about commercial refrigerated display cabinets mean an EEI calculated with the categories and M and N values from the 2014 consultation forum working documents.

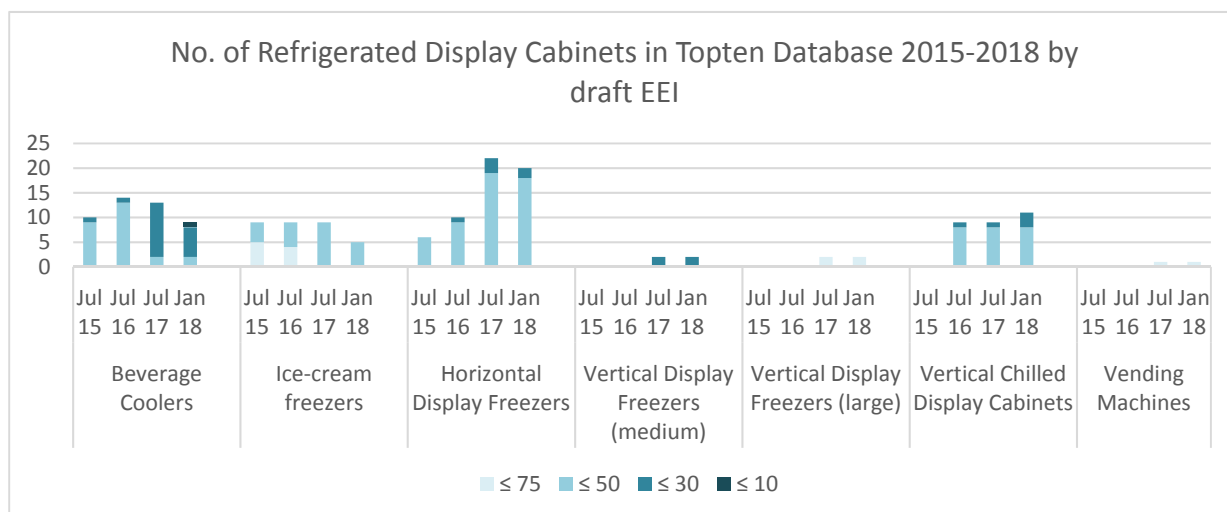


Illustration 5 – Number of Refrigerated Display cabinets in the Topten Data base between 2015 and 2018, by Energy Efficiency Index (according to draft regulations)

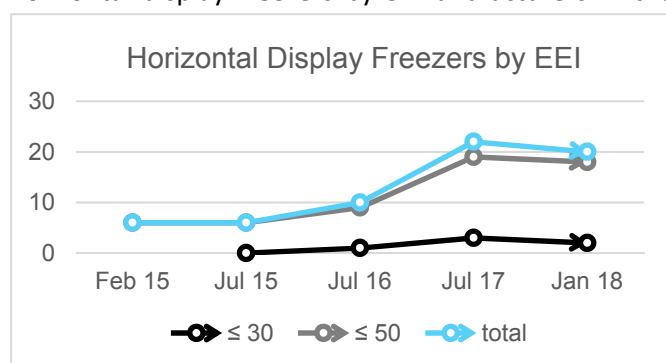
While standardised data on best available technology is very sparse, the slowly growing numbers of models listed in the Topten-product lists show that data availability has improved since 2015. This is in part due to growing awareness for energy efficiency as sales argument and procurement criterion, and in part due to projects like ProCold and Topten that specifically help the market for high-efficiency products to develop: in the absence of relevant regulation, an important motivation for manufacturers to provide standardised product information have been the rebate programmes for energy efficient commercial and professional refrigeration appliances in Switzerland and Austria (organised by ProCold).

Most **beverage coolers and ice-cream freezers** listed on Topten were tested by manufacturers according to official EN standards with the purpose of being included in the Topten lists. On their own websites and the regular market, manufacturers test and declare their commercial refrigeration cabinets according to their own measurement protocols. This makes well-informed purchase decisions by end-users difficult.

After a growing number of **beverage coolers** with an $EEI \leq 50$ (according to draft regulations) could be observed from 2015 to 2016, a significant rise of even more efficient products with an $EEI \leq 30$ happened in 2017 and 2018 - when the first beverage cooler (horizontal) with an $EEI < 10$ was listed.

After a very slow shift from **ice-cream freezers** with an $EEI \leq 75$ to $EEI \leq 50$ between 2015 and 2016, 2017 resulted in a sudden increase of more efficient products. The ProCold competition winner in March 2017 has since been significantly surpassed by more energy efficient products.

Despite the appearance of the first **horizontal display freezers** with an $\text{EEI} \leq 30$ (according to draft standards) at the end of 2015, the market development for this category was very slow until 2017 when the label for commercial refrigeration appliances was scheduled to be finalized and adopted. At this time, new technology doubled the number of models with an $\text{EEI} \leq 50$ within a short time frame and increased the number of models with an $\text{EEI} \leq 30$ from 1 to 3 models, totalling 22 efficient horizontal display freezers by 5 manufacturers in the Tooten database by July 2017. Despite the



delay in regulation, the procurement guidelines and demand from several food and beverage companies that value energy efficiency combined with the ProCold rebate programmes in Austria and Switzerland have triggered a market development for energy efficient beverage coolers.

Illustration 6 – Number of horizontal display freezers in the Tooten database between 2015 and 2018, by Energy efficiency Index (according to draft regulations)

As a result of the competition between supermarkets and discounters, demand for **vertical display refrigerators and freezers** has increased significantly, resulting in rapid market development. Supermarkets focus traditionally on high product diversity and large display areas while discounters place more importance on low prices and less importance on presentation and display areas; however, in order to reach more customers, discounters have been increasing their display area by adding more vertical refrigeration appliances in addition to the horizontal refrigerator and freezer chests. ProCold developed selection criteria for efficient vertical display freezers and the first efficient products could be listed in February 2017. The number of efficient vertical chilled cabinets has also started increasing since mid 2017.

Altogether, it can be said that, for professional refrigerated storage cabinets, the adoption and entry into force of the Energy Labelling and Ecodesign regulations has proven very effective given the jump in best available technology that was triggered. Further significant saving potential could be achieved with increased market surveillance on the effective implementation of the regulations.

For commercial refrigerated display cabinets, the delay in the regulation for LOT 12 leads to 34 TWh of missed savings each year by 2024 (ProCold calculations based on JRC estimates; see Appendix 2), meaning that the regulation would lead to more purchases of efficient products over the years, accumulating increasing energy savings. Emerging highly efficient technologies show a significant potential for energy savings that can only be achieved with the help of a regulation that makes the declaration with standardised product information mandatory – making it possible for buyers to identify the most efficient products. A more detailed analysis of the market development can be found in D2.5 “Reviewing market developments in the top-performing segment - BAT product lists”.

ProCold has helped manufacturers communicate their BAT products not only online but also at several trade fairs, especially EuroShop (07.03.2017 in Düsseldorf, Germany, award ceremony for ProCold competition, HOST (20.10.2017 in Milano, Italy) and IGEHO (11.2017 in Basel, Switzerland).

In order to support other European projects and stakeholders with the results of accumulated technical knowledge and the results of the study about online declaration of energy classes for professional storage appliances, ProCold presented all relevant information at the kick-off meeting of the EEPLIANT2 work group for professional refrigeration in November 2017 in Brussels.

As a performance indicator, the **direct savings that can be directly attributed to the actions of the ProCold project** were calculated. Details are described below in section 1.3 “Impact” (see also Appendices 3A and 3B on the project's savings).

1.2.2.2 Support by national teams

National teams provided valuable information on market development, enabled contacting new manufacturers and spotted new BAT products. Each team contacted stakeholders that had been identified for WP3 and WP4 at the European and national level. ProCold Portugal established and maintained very active contacts with Portuguese manufacturers ArcaBoa, Fricon and Mercatus. The Italian ProCold team not only successfully established contacts to Italian manufacturers such as Sagi and Friulinox, they also led a field measurement projects in cooperation with the manufacturer Sagi (see Appendix 4 Report on the ProCold Measurement campaigns in Italy). Switzerland concluded their first rebate programme for efficient commercial and professional refrigeration with 6 000 supported BAT products sold instead of regular appliances; the rebate programme had a volume of 1.2 Mio Swiss francs and achieved energy savings of 55 GWh through the 6 000 BAT products. A new three-year rebate programme started in Switzerland in January 2018. Austria started their own 3-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 BAT products by January 2018.

The Austrian Energy Agency continued to monitor the evolution of relevant legislation and policies at the EU level. To support the development of harmonized standards and directives for commercial cooling equipment – covered by Lot 12 – policy recommendations were sent to CEN. Comments on the draft regulations for Lot 12 were discussed and collected with national stakeholders.

Concerning the regulations for professional refrigeration, the Austrian Energy Agency is currently leading the relevant work package of a H2020 market surveillance project (EEPLIANT2). This project started in September 2017 and will carry on the work of ProCold in this area.

1.2.3 WP3 & WP4 – Empowering market players at central level and support for policy design & Empowering market players at the national levels

WP3 Leader – Bush Energie and WP4 Leader – SEVEN

Note: Deliverables are organised by type of stakeholder and cover relevant tasks undertaken within WP3 and WP4 (i.e. covering both European and national levels), combining the achievements for each specific stakeholder group in two documents: one public summary and one full confidential report. The reason for that was that a number of companies and organisations act on international level, or at least cover several national markets. Therefore such contacts were shared, used and multiplied by the project partners in order to benefit from the European level and nature of the project. We report on these WPs together to avoid repetitions (For more details, see the individual deliverables, structured by the target group categories).

1.2.3.1 Activity description

Activities are described in detail in the corresponding specific deliverables on the involvement of the relevant stakeholders (see for 2nd project period full confidential reports D4.4, D3.6, D3.10, D4.8, D3.14 and public summaries D4.2, D3.4, D3.8, D4.6, D3.12). In total, during the whole project, 1 195 contacts have been established (786 fully, 409 partly⁵, beyond the target of the 1 000 contacts planned in the grant agreement – 5 000 people assuming 5 individuals within each stakeholder).

	"Fully" contacted			"Partly "contacted			Fully + Partly		
<i>Project period</i>	<i>1st</i>	<i>2nd</i>	<i>1st+2nd</i>	<i>1st</i>	<i>2nd</i>	<i>1st+2nd</i>	<i>1st</i>	<i>2nd</i>	<i>1st+2nd</i>
Manufacturers	121	97	218	48	21	69	169	118	287
Food and beverage comp.	47	57	104	26	47	73	73	104	177
Retailers and direct users	47	71	118	35	64	99	82	135	217
Public authorities	86	31	117	26	39	65	112	70	182
Service companies	9	36	45	2	26	28	11	62	73
Other	86	98	184	26	49	75	112	147	259
Total	396	390	786	163	246	409	559	636	1195

Table 3: Number and type of stakeholders identified and contacted during the ProCold project

It should be noted that establishing those contacts – whatever the stakeholder group – was extremely time consuming, involving a lot of preparatory work: desk research on institutions and companies, identifying responsible individual managers, contacting and phoning a lot of persons (who are sometimes reluctant because not familiar with the topic) in order to find the proper contact (this identification can be very complex in the case of large multinational companies and organisations), reaching the person, presenting the project, motivating for a meeting or further discussion, preparing a targeted discourse, etc. Overall number of established contacts exceeded the project goal. However, the number of established contacts is not the same for every stakeholder group. Some groups were easier to establish and manage (manufacturers, public authorities), some were much more difficult to establish in comparison to existing total number of stakeholders (food and beverage companies, retailers and direct users). Service companies and intermediaries were very difficult too. The focus of the work was to reach a collaboration in which measures for more energy efficiency would be taken, such as labelling of Topten products, adaption of procurement criteria according to ProCold specification, using more green refrigerants, favour closed cabinets, etc.

⁵ "Fully" and "Partly" are gradations of an established contact (e.g. if a stakeholder would have been identified but not contacted, it would not appear in either of these categories). "Fully" means the team established contact to a suitable person within the target organisation and informed about ProCold and its goals and benefits for stakeholders. First achievements and cooperation have been achieved. "Partly" means that the team contacted and informed a suitable person within the target organisation.

1.1.3.1.1 - Public Authorities

This stakeholder group was important in two ways. Firstly, on EU and national levels, ProCold monitored the policy development and offered market feedback. Secondly, on national level, ProCold served as procurement and awareness network.

During the reporting period, at the European level (WP3), the European Commission (EC) was the most important public authority for the ProCold project. With the regulations on energy labelling, Ecodesign and F-gas phase-out, the EC creates the basis for a transparent appliance market, comparable product information on energy use and minimum product standards. The ProCold team provided input for DG Grow that may be used in the framework of the upcoming review of the Ecodesign regulation and EN testing standards. Information was also provided to DG Energy with support for the finalisation of regulation documents on commercial cold products, assumptions on savings and contacts of stakeholders. In addition, the ProCold team gave specific input to JRC (Joint Research Centre) regarding GPP criteria for food and catering services. At the EU level, the ProCold team also provided procurement information on cooling products at several other occasions, such as stakeholder meetings, events, group discussions: e.g. International Council for Local Environmental Initiatives, WWF, Cool products for a cool planet campaign, Shecco.

At the national level (WP4) 70 contacts were established with public authorities. ProCold's national partners shared experiences with the relevant ministries and other governmental and public stakeholders on green procurement of cooling products. As a major success, in Austria, the rebate programme was created to cover all ProCold's products, starting from 1/1/2017. About 1 000 products were funded thanks to this programme. In Switzerland, a national rebate programme continued and about 6 000 energy efficient cooling appliances were funded under the Swiss rebate programme, saving about 55 GWh. Other examples of procurement using ProCold's information include: minimum energy classes and use of natural refrigerants set for catering in public companies in Italy; the French team will review the energy efficient cooling products submitted to the central national buying agency for public procurers; in Czech Republic, the ProCold's procurement criteria were presented on the official website of the State Environmental Fund. Another important achievement is a raised awareness about the energy labelling of professional cooling products (through local events, press releases, articles, individual negotiations) among both the suppliers and professional public users.

1.1.3.1.2 - Manufacturers

Since Ecodesign and labelling regulations for professional cooling products were not yet implemented at the beginning of the project, energy efficiency of professional cooling products was not an issue at all. Therefore the involvement of manufacturers (WP3) was crucial for the project's success. One of the key achievements is that at the end of the project, 30 manufacturers were represented and published in the Topten lists, with a total of 170 products in 11 sub-categories (in comparison to 25 manufacturers and 136 products at the mid-term of the project). Due to the combination of the evolving legislation and the ProCold awareness activities, we could witness manufacturers improving their models continuously and project criteria could be even tightened several times during project period. The list of manufacturers displayed on Topten lists at the end of the project is the following:

- Beverage coolers: Frigoglass, Gamko, 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
- Storage refrigerators, freezers and refrigerator-freezers: Adande, Alpeninox, Angelo Po, Cool Compact, Coreco, Desmon, Efficold, Electrolux, Gemm, Gram, Ilsa, Liebherr, Mercatus, Sagi
- Minibars: Dometic, Indel B, ISM
- Wine coolers: Eurocave, Liebherr
- Refrigerated vending machines: Sielaff

Manufacturers carried out strong efforts to get on the Topten lists or to reach best rankings within the lists. Many manufacturers and especially national importers label their products with Topten logo to push the sales of the energy efficient products. In addition, ProCold maintained good exchange with the manufacturers' associations such as EFCEM (with which an event was co-organised at the HOST fair in Milano in October 2017) and the project was presented at several professional fairs.



Illustration 7: ArcaBoa model displaying Topten/ProCold sticker (left), Swiss rebate sticker (right)

Another important achievement with manufacturers is the successful ProCold product competition which boosted and highlighted the most efficient technologies and technological advances available on the European market. The results of this product competition have shown that manufacturers are willing and able to produce very energy efficient cooling products. Winning models (which were also tested in laboratories, see WP5) were presented at the EuroShop fair in March 2017. There were 4 winning manufacturers in five product categories (vertical supermarket refrigerated display cabinet, beverage coolers, ice-cream freezers, vertical chilled display cabinets, refrigerated glass fronted vending machines).

At the national level (WP4), the ProCold teams looked for manufacturers and importers for these efficient models, brought support to them (acting as a neutral party while they had commercial discussions with clients on energy efficiency) and broadly raised awareness and interest of manufacturers and distributors by informing them about the ProCold-project, the EU labelling regulation, the F-gas regulation, the project product competition and the Topten-lists. Several national manufacturers' associations were addressed too as well as several national fairs were attended.

To our knowledge (because feedback from economic operators is sometimes difficult to get), at the end of the project, 13 manufacturers and importers label their Topten-products on their websites and/or in promotional material with the Topten-label (in comparison to 8 manufacturers at the mid-term of the project).

1.1.3.1.3 – Food and beverage Industry

The food and beverage industry was a very important target group because the majority of all beverage coolers and ice cream freezers is procured by a handful of large food and beverage companies. 104 contacts were established with food and beverage companies.

If one of these companies can be motivated to improve its procurement and product specifications, the energy savings are multiplied thousand-fold because they make the specifications, manufacture themselves or choose the manufacturers, deliver and install the cabinets that are usually branded for their food and beverage products at retailers, kiosks, take-aways etc. The main stakeholder types include:

- Food and beverage industry for cooled or frozen products (dominated by the two global players Nestlé and Unilever)
- Beverage industry (e.g. Coca-Cola, Pepsico, Red Bull and local brands)
- Beer industry (e.g. Heineken, Ottakringer and other breweries)

ProCold followed a bottom-up approach with coordinated activities with national branches of the food and beverage industry. The national (WP4) and European (WP3) actions had a strong interaction (national improvements might influence the general decisions). At national level, ProCold partners informed the most important beverage and food companies about the energy efficiency of cooling products, their benefits, the ProCold project itself and its numerous activities, and invited them for cooperation.

Experiences showed that reaching relevant representatives from food and beverage companies was time consuming and very difficult. Several partners visited industry fairs and published articles in appropriate media, in order to attract attention of the relevant stakeholders.

The rebate programme in Switzerland led to significant increase in number of energy efficient cooling products available on the market and was appreciated by Unilever and Nestlé. In Austria, the rebate programme led mainly to large procurement requests by beverage companies.

The persistent difficulty observed (landlord - tenant type) was that food and beverage stakeholders do not save directly from investments into efficient models and they do not pay the electricity bills. Hence – besides the rebate programme – the motivation was mainly based on the image of the company, the CSR policy of the company and the personal interest of the person in charge.

1.1.3.1.4 – Retailers and Direct Users

The stakeholder group of retailers and direct users was very wide and diverse and consisted of many types of users of refrigeration appliances such as retailers (supermarkets and stores), hotels, restaurants and pubs, fast-food chains, catering companies. Addressing large retailers and retailer

chains showed to be efficient but had to be done mainly on national level (WP4) as the retailers are rather nationally organised – 135 contacts were established with retailers and other direct users.

At European level (WP3) the ProCold team informed several stakeholders, especially EuroCommerce. The team mainly followed a bottom-up approach with coordinated activities with national branches of retailers and national direct users at national level. Individual project partners chose different strategies to approach individual stakeholders, since contacting local hotels and restaurants, grocery, take-aways, bakeries, caterers was very time consuming. Some partners addressed hotel and restaurants chains, grocery chains and wide national businesses. Several partners also published articles in industry media (specialised media for restaurants, hotels, retailers etc.).

The ProCold procurement tools (see WP6) were made available to several direct users and number of retailers, restaurants and hotels declared their intention to use ProCold procurement tools for future purchases. For example Coop, one of the biggest retailers in Switzerland, revised its procurement criteria and adopted the Tooten energy efficiency criteria; The Professional Association for Gastronomy and Industrial Kitchen Equipment in Germany intends to use the ProCold's tool as well.

Some partners presented procurement criteria in appropriate industry media. For example, the Czech article in Hotels&Gastronomy (Svět HG) magazine:



Illustration 8: Example of publication on the ProCold project in the professional press in Czech Republic

1.1.3.1.4 – Service companies

Service companies and service providers, like vending machine providers, minibar services, water dispenser providers, but also installers, kitchen planners and consulting firms advise different types of end-users. They were targeted to make sure they would include the ProCold information in their advice to their customers.

Although EU level was not covered by the project for this stakeholder group, the ProCold team had good and regular contacts with the European Vending Association (EVA) that disseminated ProCold's information to its members, particularly regarding the ProCold product competition. Refrigerated vending machines was one of five competition's categories and also became a new Tooten-product list category. However, the current Tooten-product list on vending machines displays only one

product. The number of products with green refrigerants on the market is still very limited and, usually, the vending machine appliance data was not presented in accordance to the European standard (during the course of this project).

At national level, 62 contacts with service companies were established.

In Austria and Switzerland, the rebate programme will probably expand, covering a growing database including more product categories. Hence, it may also cover vending machines – which could lead to a similar positive effect as for the categories already covered by the rebate programme. Some other partners have established collaboration with their national vending industry, sharing project experience, knowledge and encouragement to promote efficient products on the market. For example, a successful cooperation was implemented with a consulting company focusing on refrigeration solutions for hotels and restaurants in Austria; the "German Green Music Initiative" focusing on energy efficiency in music clubs cooperated with ProCold actively.

It is also worth noting that the meetings held with service companies and especially consulting firms also showed and confirmed that ProCold and Topten fulfil a mission that no-one else is undertaking (analysing the details of energy consumption related information for specific products) but that others are using (and eventually selling) – and therefore enabling a leverage effect for the efficient models in the efforts to transform the market.

1.2.3.2 Support by national teams

WP3 was focused on the EU level. The work was coordinated and mainly carried-out by the Swiss team (Bush Energie) with significant assistance from the French Partner Guide Topten (who organised 3 missions to Brussels over the whole project to meet European institutions). The competition tasks were mainly organised by the Oeko Institut and AEA, with the support from ADEME, Bush Energie and Guide Topten. Also Politecnico di Milano and Guide Topten coordinated the final event at the HOST fair. In addition, stakeholders' contacts were shared among partners when relevant.

WP4 was designed as an action implemented by the project partners at the national level. National partners have been active in identifying the suitable contacts among the individual stakeholder groups (initial stages), in establishing and maintaining contacts, and in organising individual cooperation – e.g. linked to dissemination, energy label use, direct measurement of electricity consumption, ProCold's criteria use, etc., as described above and in the Deliverables (see for 2nd project period full confidential reports D4.4, D3.6, D3.10, D4.8, D3.14 and public summaries D4.2, D3.4, D3.8, D4.6, D3.12)

In addition, during each of the project meetings, and electronically during the course of the project, national partners have shared the knowledge and experience in engaging individual companies and types of stakeholders. This has allowed sharing tips on more effective ways of engaging with several specific stakeholders in the various participating countries. In some cases, the specific contacts were mutually exchanged among countries (relevant for multinational companies).

Actions undertaken, lessons learned and results achieved in the other WPs, such as WP2 on market and regulatory evolutions and WP5 on the product competition and WP6 on dissemination and CSR tools, have also been used by the national partners for their work in WP3 and WP4.

Each national team contacted many stakeholders and provided support based on the project guidelines and the Topten lists of BAT professional and commercial cold appliances. The following table summarizes the number of contacts made and results achieved throughout the project:

Country	Contact established	Declaration of Topten products	Procurement with Topten	Topten labelling online	Green refrigerants	Closed cabinets
EU	145	16	0	3	18	8
AT	175	0	0	0	0	0
CH	154	29	22	9	27	10
CZ	100	0	3	0	7	30
DE	161	18	5	0	7	5
FR	111	2	0	2	5	0
IT	113	8	5	0	27	21
PT	147	2	0	1	8	6
SE	89	1	3	0	0	0
Total	1 195	76	38	15	99	80

Table 4: Contacts and type of actions reached in the various participating countries

Glossary:

Figures	The figures show the sum of “achieved” + “partly achieved”.
Contact established	“Fully” and “Partly” are gradations of an established contact (e.g. if a stakeholder would have been identified but not contacted, it would not appear in either of these categories). “Fully” means the team established contact to a suitable person within the target organisation and informed about ProCold and its goals and benefits for stakeholders. First achievements and cooperation have been achieved. “Partly” means that the team contacted and informed a suitable person within the target organisation.
Declaration of Topten products	Manufacturers or retailers tell us which models comply with Topten.
Procurement with Topten	Procurers tell us which of their procured models comply with Topten.
Topten labelling online	Procurement favours Topten models
Green refrigerants	Manufacturers or retailers label corresponding models with Topten on line / at fairs
Closed cabinets	Stakeholders favour models with green refrigerants
	Stakeholders favour models with closed doors

The project performance indicator is 5 000 people with increased capacity/skills/competencies. This means 1000 stakeholder organisations, assuming 5 individuals within each stakeholder (according to the grant agreement).

The table reflects specific concrete results leading to energy savings – actually going far beyond the objective of just increasing skills/capability/competencies. **With 1 195 stakeholders, the team has achieved the goal and exceeded the 1 000 stakeholder organisations (5 000 people).**

The ProCold team organised a successful competition for the most energy efficient plug-in professional and commercial cooling and freezing appliances. This competition was the first of this kind and a number of manufacturers expressed interest and joined the competition.

One of the most striking successes is the prolongation of the Swiss rebate programme and the development of the new Austrian rebate programme focused on cooling products according to the Topten-list.

In general, the ProCold project operated as informational base providing customised information to targeted stakeholders groups on energy efficiency of professional cooling products. The ProCold team has provided support regarding regulatory work, procurement in public authorities, procurement among users and beverage and food companies – while at the same time motivating manufacturers to enlarge the variety of supply for such products.

1.2.4 WP5 – Product competition for most efficient professional cold models on the European market

WP5 Leader – Öko-Institut

1.2.4.1 Activity description

In the following we first present a technical description of the activities undertaken for WP5 and then a summary of the competition and the testing activities.

The ProCold product competition served several important objectives within the overall ProCold project:

- To enable a fair comparison based on defined measurement standards.
- To encourage early uptake of new and upcoming Ecodesign regulations.
- To increase the number of efficient models in the Topten lists and generally drive the market towards improved energy efficiency.

It aimed to achieve this by:

- **Identifying** the professional and commercial cold products with the highest energy efficiency (and climate friendly refrigerant use).
- **Highlighting** and increasing visibility of such products among professional buyers and other stakeholders.
- **Promoting** their further market uptake, and
- **Motivating** the development and offer of increasingly efficient energy-using products in the European market.

A core element of the ProCold product competition was the independent testing of refrigeration equipment submitted by manufacturers based on clearly defined measurement rules (and not e. g. a jury).

In the first reporting period the competition rules were drafted and published, a call for offers for the testing conceived and sent to six European laboratories (DTI, IMQ, RD&T, Re/genT, Tuv Sued and VDE) and manufacturers approached to inform and motivate about the ProCold competition.

In the second reporting period, the following activities were implemented:

1. **Continued motivation of manufacturers to participate in the competition** - Manufacturers and their associations were contacted by Oeko-Institut and the national teams to inform about and motivate for the competition and answer questions.

2. **Publication of a Q&A document on the competition and competition rules and update of competition rules** - On 5 September 2016 a Q&A document (see D5.1 Supplement to the competition rules) was published, which clarified potential questions with regard to specific provisions of the competition rules.
3. **Supplements to the competition rules** - To facilitate submission of appliances for the competition and subsequent selection for testing two additional supplements to the competition rules to be used with each submission were created: a checklist and a submission form (see D5.1 Supplement to the competition rules).
4. **Selection of laboratories for testing of the nominated appliances** - Based on a best value for money principle, two laboratories (DTI from Denmark and Re/genT from the Netherlands) were selected to do the testing of appliances submitted to the ProCold competition (see D5.4 Analysis and overview of laboratory reports). Contracts for testing were arranged with each laboratory.
5. **Selection of submitted appliances for testing** - All submissions were first checked for general compliance with the competition rules and then preliminary ranked according to reported energy performance to select the top ranking products for independent testing. In cases where two appliances had similar EEIs, both appliances were sent to be tested.
6. **Testing of appliances and evaluation of test reports** - Seven appliances were tested across the five product categories defined for the competition to identify a clear winner in each category. This step included managing selection of appliances from manufacturer facilities and delivery to test laboratories. Also, based on testing outcomes, decisions on disqualification of entries and testing of second best places appliances based on preliminary ranking were made (see D5.4).
7. **Identification of winning products** - Based on test reports for each appliance, the winning products were confirmed within the ProCold consortium and manufacturers informed.
8. **Testing of two additional appliances (outside of competition)** - Two additional tests of an ice cream freezer and a beverage cooler were performed according to the same provisions as the competitions entries. These were not official submissions to the competition. These were known from the Topten lists and the tests had the purpose to see how they performed compared to the officially submitted appliances.
9. **Planning and arrangement of the award ceremony** - A partner for the competition award ceremony was found (Ecopark Forum at Euroshop) and the award ceremony prepared, including drafting the programme, coordination of participating manufacturers, design and manufacturing of the awards, certificates, logo for use with winning products and stickers.
10. **Award ceremony at Euroshop 2017** - The ProCold competition award ceremony took place on 7 March 2017 at Euroshop, Germany with all of the winning manufacturers and part of the ProCold team present.
11. **Compilation of competition results** - As one of the work package deliverables the competition results were compiled in a separate document (see D5.2 - Product competition results).

It was possible to implement the competition at lower third-party costs than expected. Hence, it was decided to implement additional testing to improve knowledge around specific issues that have been raised throughout the project. This additional testing required some additional activities, i.e.

- 12. Defining the tests objectives, including definition of product categories and specifying the test to be performed** - Several interrelated tests and objectives were defined to provide additional insights on particular issues: beverage cooler glass door vs. solid door, older still used vs. newer test norms, performance of household refrigerator vs. commercial refrigerator and performance of static cabinet in comparison to similar forced-air cabinets.
- 13. Selection of laboratories for testing** - The top three laboratories from the product competition were asked to provide offers for this additional testing. Based on price and available capacity DTI in Denmark and Re/genT in the Netherlands were again selected for testing.
- 14. Purchase and testing of appliances** - Testing took place in December 2017 and January 2018.
- 15. Report on results of this additional test** - A report summarizing the test and conclusions was prepared (see Appendix 5: ProCold Additional Testing Report).

1.2.4.2 Support by national teams

National teams supported the various implementation steps of the ProCold product competition. Besides motivating their national manufacturers to submit product to the competition, national teams were involved in the following activities:

- Providing feedback on the competition documents;
- Selecting laboratories based on a best value for money principle. The selection was confirmed by the entire ProCold team;
- The selection of appliances for testing was discussed with all ProCold national teams to ensure that the rules set at the outset of the competition were properly implemented and a proper preliminary ranking established;
- Individual national teams assisted in the selection of appliances for testing; Topten Switzerland (managed by Bush Energie) made the necessary arrangements with the companies providing two appliances for the additional tests outside of the competition;
- The general concept for the award ceremony was discussed among all ProCold members; the ceremony itself was attended and run by representatives from AEA, ADEME and Topten Switzerland, who each prepared presentations (a representative from Oeko-Institut was not available on the most suitable day during Euroshop due to other non-changeable commitments);
- Providing feedback on the competition results documents, in particular AEA, Topten Switzerland and Guide Topten;
- Preparation of the additional tests was done in close cooperation with Topten Switzerland; the general approach was discussed with members from all national teams;
- Feedback on the report on additional testing was received from Guide Topten and Topten Switzerland.

1.2.4.3 Overall summary of product competition

The competition was originally timed to coincide with the introduction of EU energy labels for professional and commercial refrigeration cabinets. As the energy label for commercial refrigeration display cabinets was delayed (and still not in effect today) the ProCold competition had to be adapted. In particular, product categories, underlying test norms and calculation procedures had to be carefully defined – in absence of finalized specifications for each. Draft versions available close to the submission deadline were used. It was, however, conceded that a competition for the most

efficient products in Europe would serve a very useful purpose even or especially in absence of strong and clear regulatory mechanisms for the promotion of energy efficient commercial refrigeration.

One of the main competition principles was that the winner would be identified based on actual and independent energy consumption tests and not, e.g. a jury. Manufacturers were invited to submit their most efficient products in any of five clearly defined product categories (see *Table 5*): Vertical chilled storage cabinets, beverage coolers, small ice cream freezers, vertical supermarket refrigerator cabinets and refrigerated glass fronted vending machines.

Category	Applicable current or future Ecodesign regulation	Size and type	Refrigerant	Temperature class	EEL determination
Vertical chilled storage cabinets	Ecodesign Regulation (EU) 2015/1095 of 5 May 2015	1-door, 400-700 litres net volume calculated according to EN 16825:2016 (approved)	Refrigerant with global warming potential (GWP) below 150 (e.g. R290, R600a, CO2)	M1 according to EN 16825:2016 (approved) (-1°C to +5°C)	At 30°C/55% RH based on measurements according to EN 16825:2016 (approved) and EEL calculation according to Ecodesign Regulation (EU) 2015/1095
Beverage coolers	(draft) European Ecodesign Regulation for refrigerated commercial display cabinets as available on 31 August 2016	250 – 550 litres net volume calculated according to FprEN 16902 (under approval), vertical cabinet with one transparent door		K1 according to FprEN 16902 (under approval) (0°C to +7°C, $\phi \leq +3.5^\circ\text{C}$)	At 25°C/60% RH based on measurements according to FprEN 16902 (under approval) and EEL calculation according to applicable (draft) European Ecodesign Regulation
Small ice cream freezers		150 – 500 litres net volume calculated according to FprEN 16901 (under approval), with transparent lids		C1 according to FprEN 16901 (under approval) (-18°C)	At 30°C/55% RH based on measurements according to FprEN 16901 (under approval) and EEL calculation according to applicable (draft) European Ecodesign Regulation
Vertical supermarket refrigerator cabinets		Total display area (TDA) between 0.5 and 3 m ² calculated according to EN ISO 23953-2:2015		M1 (-1°C to +5°C) according to EN ISO 23953:2015	At 25°C/60% RH based on measurements according to EN ISO 23953-2:2015 and EEL calculation according to applicable (draft) European Ecodesign Regulation
Refrigerated glass fronted vending machines		Category 2 “Refrigerated glass fronted can and bottle, confectionery & snack machines” according to EN 50597:2015		Category 2 machine type (12°C)	At 25°C/60%* RH based on measurements according to EN 50597:2015 and EEL calculation according to applicable (draft) European Ecodesign Regulation

Table 5: Definition of product categories eligible for the ProCold product competition 2017 (draft test norms have been finalized and approved by the end of the project; the table shows the norms as they were valid for the competition)

The comparison and confirmation were done based on independently performed energy consumption measurements according to the latest available measurement norms and calculation procedures as described in *Table* . Further criteria were the use of refrigerants with a Global Warming Potential (GWP) below 150 and the availability of the product for purchase on the European market as per the submission deadline (“no prototypes”).

1.2.4.3.1.1 Winner identification

Products in each product category were assessed according to the defined measurement standards and test conditions. The Energy Efficiency Index (EEI) was the core performance criterion based on which the winner in each category was determined. EEI calculation and test conditions were as much as possible based on existing (in the case of professional storage cabinets) or expected (in the case of commercial refrigeration cabinets) energy labelling regulations.

Due to budget constraints, it was clear from the outset that not all submitted appliances could be tested. Instead, as part of their submission, manufacturers were required to report energy consumption and EEI and include the underlying test report. Appliances submitted to the competition were then preliminary ranked according to reported EEI.

Based on submission information and reported energy performance, the most efficient appliance in each category was selected for independent testing. Independent tests were performed by two internationally recognised and carefully selected laboratories: Re/genT in the Netherlands and DTI in Denmark.

In categories in which two appliances had similar reported energy performance, two independent tests were performed (this was the case in the vertical chilled storage cabinet category). As one of the tested cabinets did not meet reported performance, this approach proved helpful for timely winner identification. In cases in which testing repeatedly failed (one case in the vertical supermarket refrigerator category), the candidate appliance with second best performance was additionally tested.

Two additional appliances were tested (one each in the two categories beverage coolers and ice cream freezers), which were not officially submitted to the competition but for which the ProCold consortium expected high efficiency or was interested in better understanding their comparative performance. These were not officially part of the competition (as they were not formally submitted) but were tested to gain a better understanding of market development and top performing products in these categories. For beverage coolers, the EEI of the additionally tested appliance was higher (less efficient) than the EEI of the model winning the ProCold competition in this category. For ice cream freezers, however, the additionally tested appliance indeed had a lower EEI than the winning model in this category, albeit within tolerance margins of <10%. Of course, participation in the competition was voluntary and submission based. Hence, there was no guarantee that the competition would identify the most efficient product in absolute terms in each category. The result of the additional appliance testing indicates that the market might provide even more efficient refrigerating equipment compared to the benchmarks set by the competition.

A winning product was determined in each category based on confirmed energy performance. The winners of the ProCold Product Competition 2017 are:

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 6: Winning products in the 5 categories of the ProCold product competition

1.2.4.3.1.2 Winner recognition

Winning products were first announced and awarded at the international EuroShop fair on 7 March 2017 in Düsseldorf, Germany, with Euroshop being the biggest international fair for the retail sector and, hence, of particular interest for equipment manufacturers. The award ceremony took place within the programme of the Ecopark Forum and embedded in several presentations on energy efficiency in plug-in refrigeration equipment also with regard to potential EU Ecodesign and energy label regulation. All winning manufacturers were present and received recognition for their winning models (see figures below).



Illustration 9: Examples of award, certificate and award logo given to each manufacturer of a winning product



Illustration 10: Picture of ProCold Product Competition award ceremony with manufacturer representatives and ProCold team members

Manufacturers were encouraged to use the ProCold logo in the context of the promotion of their winning products (see figure 3 for an example). Winning products were also highlighted in the regularly updated Topten lists of the most efficient products in Europe.



Illustration 11: Examples of manufacturer Liebherr using the ProCold award for promotion of their products at Euroshop and Internorga trade fairs

Manufacturers also used other opportunities to promote their most efficient products using the recognition received by ProCold, e.g. in presentations, e-mail signatures and online activities (see WP6 below).


1.2.4.3.1.3 Additional testing

It was possible to use the remaining budget that was not used for the testing of products submitted to the competition to perform additional independent energy consumption tests (see Appendix 5 ProCold Additional Testing Results). These were designed to help advance understanding of available test norms, differences in product categories and general efficiency improvement potentials. Four appliances were tested: Two beverage coolers (with and without glass door), one household refrigerator, and one professional static storage cabinet (freezer). The tests had several objectives and results:

- Document the direct differences in energy efficiency between otherwise comparable glass door and solid door beverage coolers. The ProCold tests show a significant improvement in energy consumption of more than 40% for **solid door cooler versus a glass door** equivalent cooler. Wherever not otherwise necessary **closed-door beverage coolers** should be preferred.
- Understand the implications in outcome in applying a previously used test norm (EN ISO 23953-2:2015) for beverage coolers to the most recent one proposed for the future Ecodesign regulation (EN 16902:2016). Manufacturers may report energy consumption according to different test norms: understanding the differences is important to compare declared energy efficiency. ²

The ProCold test shows that **tests of beverage coolers according to EN 16902 may significantly**

underestimate actual use energy consumption as the test norm does not include a required door opening sequence. In the future this could be confirmed by additional energy consumption measurements in actual use. Sometimes the older EN ISO 23953:2015 is used for testing energy consumption of beverage coolers. As EN ISO 23953:2015 includes a 12h door opening sequence, beverage coolers that display low energy consumption according to this norm will likely show even lower energy consumption when tested against EN 16902. However, EEI calculations cannot be compared directly between the two norms, as EN 16902 uses net volume as the basis for calculation, while in EN ISO 23953:2015 Total Display Area (TDA) is used. As net volume measurement is not part of EN ISO 23953:2015 an important figure is missing to derive comparable EEI values.

- Explore possible differences in achieved energy efficiency of household refrigerators compared to professional / commercial refrigerators. The ProCold tests indicate 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, the different performance may primarily stem from the fact that commercial appliances may have major unexploited efficiency potentials as compared to household refrigeration equipment for which an energy label and Ecodesign requirements have been in effect for a while.
- Gain a principle understanding of professional static cabinet energy performance in relation to forced air cabinets, as static cabinets are – as of January 2018 – exempted from all current and proposed Ecodesign regulations.  The ProCold tests indicate that static cabinets can achieve high energy efficiency compared to forced-air cabinets. They seem particularly suitable for use-cases for which the extra opening of the drawers does not constitute a significant burden (e.g. when the freezer is only opened sparingly). For the future, it is recommended to include static cabinets in the Ecodesign and Energy Labelling regulation to allow for such direct comparison of energy performance.

1.2.4.3.1.4 Conclusions and recommendations

The ProCold product competitions helped to provide **recognition to 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. Indeed, in some product categories we already see newer more efficient models available in the market.

In two categories (beverage coolers, small ice cream freezers) appliances were **introduced to the market** for the ProCold competition. In addition, the awarded **refrigerated vending machine** submitted by manufacturer Sielaff is the first commercially available using CO₂ as a refrigerant, potentially setting a base case for other manufacturers to follow and top.

Winning products across product categories demonstrate that **energy efficient products with natural refrigerants are available today**, providing significant energy and cost savings to users. Results in all test categories confirmed or exceeded highest known energy performance (as listed on the Topten portals at the time of the competition).

In the storage cabinet category (for which energy label and Ecodesign regulations are in place) one competition entry had to be disqualified as it **did not meet displayed energy performance**. It is unclear if this is just an exception or representative of a more widespread phenomenon and raises the question **if and how market surveillance should be intensified to identify deviations from labelled values**. However, the low number of tests in the competition does not merit a definitive answer to this question.

Net volume and total display areas (TDA) of cabinets have a substantial influence on EEI calculations and results. However, interpretation of test standards may not be unambiguous. In particular, in the supermarket refrigerator cabinet category manufacturers treated glass windows on the side of the cabinet differently. Including or not including side windows greatly influences total display area and hence EEI (in one case this changed EEI from 34 to 46). The ProCold consortium had to take a decision, after consulting with experts, on which basis EEI should be compared and decided not to take side windows into account. Net volume calculations also deviated in other categories, albeit within tolerance margins. Future revisions of **test standards should ensure that net volume and TDA calculations are unambiguously defined**. Also, rating plates of display cabinets, e. g. for beverage coolers, showed net volumes much higher than according to latest test norms. However, manufacturers are not required to display volume according to specific test norms as no regulation is yet in place.

The competition exemplified the **value of independent testing of energy performance**. Two of the tested cabinets were either not meeting performance requirements or had significantly higher EEI compared to reported energy performance. **Possibly, only such independent testing can reveal such cases.**

Setting up of cabinets for testing can take time, in particular when cabinets are very sensitive to changing environmental conditions. As this preparation time is presumably not available when cabinets are set up in practice for actual use, there is a **risk that appliances only achieve nominal performance in artificial test settings and would show much higher energy consumption in real settings**. To bring test energy consumption closer to real use energy consumption, 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 achieve.

For the tested vending machine, the movement of parts within the appliance impeded the placement of temperature sensors for testing, thus slightly modified software had to be used for testing to limit movement of parts. This might open loopholes for possible circumvention, if the software identifies the specific testing situation and allows for performance adjustments (there is no indication that that was the case here). **In future generations of refrigeration appliances, software will likely play a more important role**, providing a range of specific functions, e.g. monitoring of cabinet status or adaptation to current performance requirements. This raises questions with regard to the “default” settings that must be used for testing. Test norms and Ecodesign regulation should take this into account, e.g. by defining unambiguous “default” settings for testing.

1.2.5 WP6 – Dissemination, know-how transfer to procurers and users on why and how commercial refrigeration can improve

WP6 Leader – AEA

Work package 6 covered the project dissemination activities and the promotion of the product competition. It was designed to deliver targeted promotion of energy efficient and climate friendly professional and commercial cold products.

1.2.5.1 Activity description

All activities in this WP can be described according to the following tasks according to the Grant Agreement in full detail.

T6.1 Cooperation with Topten portals

Throughout the whole project period the cooperation with topten.eu was continuous. All project partners used their national websites to present the product lists and to disseminate content of the project in their national language. Some examples are given in the pictures below. A full documentation of the cooperation with the Topten portals is available in the public deliverable D6.1.

As central international websites www.topten.eu/pro-cold and <http://www.pro-cold.eu/> were used.

Alongside with the national Topten websites of the ProCold partners, a cooperation was also organised with Topten in [Luxembourg](#), the [UK](#) and in [Lithuania](#).

The image displays three screenshots of national Topten websites, each showing a comparison table of refrigeration units. The tables include columns for brand, model, and various technical specifications such as energy consumption, volume, and temperature range.

usporne.spotrebice.cz (Czech): The table lists models like HCS R2 Side Engine, COMPACT K 210 RG, EHZHBAA, HMRG-150, and HMRG-200. It compares technical specifications such as energy consumption (kWh/year), volume (liters), and temperature range.

guidetopten.fr (French): The table lists models like Superior Plus K 72 G, Superior Plus M 72 G, Superior Plus M 84 G, Superior Plus M 62 G, and Superior Plus M 70 G. It compares technical specifications such as energy consumption (kWh/year), volume (liters), and temperature range.

eurotopten.it (Italian): The table lists models like R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, R1020S R800a, and R1020S R800a. It compares technical specifications such as energy consumption (kWh/year), volume (liters), and temperature range.

Illustration 12: Screenshots of national Topten websites, examples of the Czech, French and Italian websites

The following table gives an overview of the different national and international websites.

Country	Website
Europe	www.topten.eu/procold
Austria	www.b2b.topprodukte.at
Czech Republic	http://www.uspornespotrebice.cz/komerčni-chladnický/
France	http://www.guidetopten.fr/home/topten_pro/froid-commercial-et-professionnel.html
Germany	https://www.ecotopten.de/professioneller-einkauf
Italy	https://topten.it/business
Portugal	http://www.topten.pt/index.php?page=sobre_o_procold
Sweden	http://www.toptensverige.se/produkter/foretag/forvaringskyl
Switzerland	https://www.topten.ch/business/article/procold-pm-fr

Table 7: URLs of the 8 national and 1 European platform displaying the Topten and ProCold information

T6.2 Calculation tool

The first version of the ProCold calculator (D6.2) was created at the beginning of the project. This Excel based tool was designed to calculate the possible monetary and CO₂ savings of efficient professional and commercial cold products. The tool is able to compare the performance of the user's product with a similar topten.eu listed product. To compare products with a similar volume, the EEI was used. Potential buyers can insert the purchase price of the products, which allows a calculation of the total life-time costs of the appliances.

The tool was used by the ProCold partners during meetings with stakeholders to estimate and underline possible energy savings. Therefore different language versions, reflecting national currencies and country specific CO₂ values (if applicable) were created.

To reflect the regular updates of the Topten-product lists, the calculation tool was also updated regularly.

The following picture shows the central input and output parameters of the calculation tool.

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 / m³	
Annual energy consumption (AEC = TEC * 365)	1871	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
Your product(s)	14968 kWh	2000 €	2994 €
Topten product(s)	5202 kWh	2400 €	1040 €
Total savings	9766 kWh		1553 €
			4.30 t

Illustration 13: Data input fields of the ProCold calculation tool

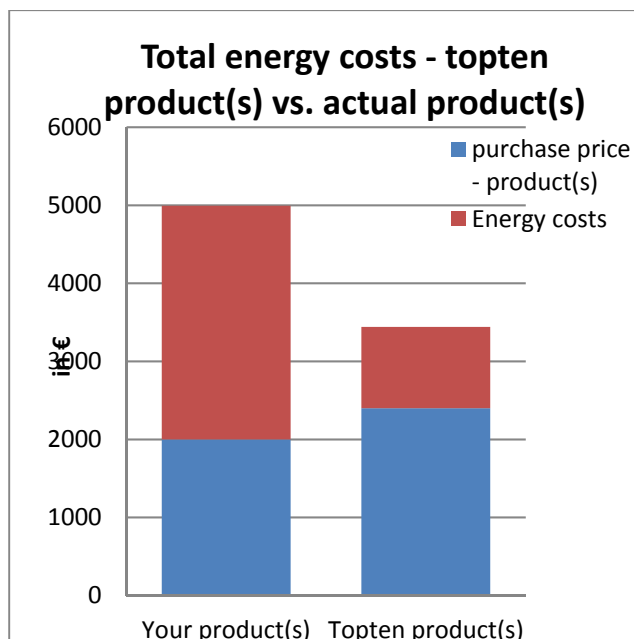


Illustration 14: Comparison of the user's product (left) with a Topten listed product (right)

T6.3 CSR Tools

During meetings with the stakeholders also the non-financial benefits of energy efficient cold products have been highlighted. Stakeholders were invited to use the Topten logo – therefore a specific guideline has been created. Throughout the whole project period, the project partners used brochures specifically designed for the main stakeholder groups. These brochures carried customised messages pointing out the benefits of using the most efficient cold products.

For the ProCold award ceremony, a specific logo for the winning products as well as a trophy have been designed. This logo was used in some of the manufacturers' Email signatures, positively highlighting the project.



Illustration 15: Email Signature with ProCold logo ⁶

TIPPS ZU GEWERBLICHEN KÜHLGERÄTEN



Nutzen Sie unsere Broschüren um das richtige gewerbliche Kühlgeräte zu finden und die Energiekosten zu reduzieren.
» Erfahren Sie mehr

Illustration 16: ProCold Brochure (eg. rom AT)

⁶ Contact name and direct phone number removed due to data protection

T6.4 Press releases, articles and press coverage

During the whole project period a constant dissemination via several media channels took place. The target was to address the general media as well as more specialized magazines. Articles were published online, printed and also social media channels were used to spread ProCold information. This task started in month 6 and was then continuous. The general public was addressed through printed articles, website articles, online articles and press releases. The minimum goals were one project press release in every country, one article printed and several online articles published in professional media and at least 3 articles printed or published online targeting the general public. These goals have been achieved and exceeded, and further details and pictures are presented below.

In total 29 press releases have been issued by the project partners altogether, 19 during the second reporting period. This number includes the joint press release, which was made on the 7.3.2017 to specifically highlight the competition results. The press releases have been sent out to media partners directly, were published online on the partner's websites or were spread via national media servers. An English draft version of each press release has been created by the WP leader and was translated by the national partners. This way, full media attention was ensured, especially from the professional press.

In terms of media coverage each partner chose different channels and dissemination activities. Examples are ranging from information letters to stakeholder groups (2 500 restaurants have been addressed in Sweden), to video spots (Portugal), tweets (Czech Republic, France) and interviews (Italy). During the project period more than 100 (71⁷) website articles, 40 (33) printed articles and 24 (9) social media postings have been made. Various examples form different dissemination activities are presented below.



Illustration 17: Newspaper article from France (left) and from Sweden (right)

⁷ The numbers in brackets show the effort of the second reporting period



Illustration 18: A printed article in an Italian magazine (left) and Online Article from Austria (right)

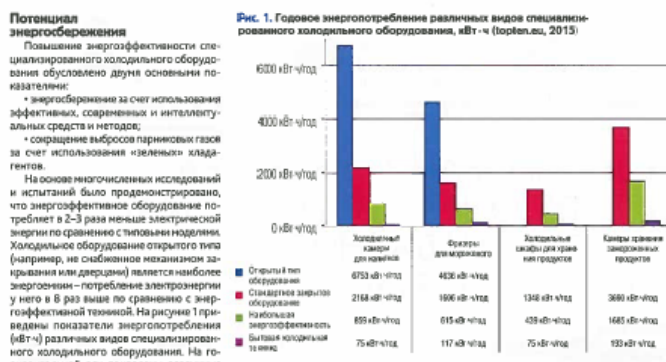


Illustration 19: A printed article in a professional magazine from Belarus (left) + Website article from Austria (right)

T6.5 Disseminating product competition

In cooperation with WP5 the ProCold product competition was publicised. To draw attention on the results, a special joint press released was published on March 7th 2017 parallel to the award ceremony at the EUROSHP fair in Dusseldorf. The fact that the product competition was vendor independent was a very positive argument in the press coverage. In the weeks after the event, several journalist requests were answered and several articles published.



Im privaten Haushalt wird jeder Konsument bei einer Neanschaffung eines Kühlschranks auf die Energieeffizienz achten!

Warum wird bei gewerblichen Kühlschränken und Kälteanlagen nicht auf die Energieeffizienz geachtet?

Wie findet man energiesparende umweltfreundliche Geräte für den gewerblichen Anwendungsbereich?

Das internationale [Projekt ProCold](#) bietet Informationen in 8 EU-Ländern. Die Energieverbrauchsdeklaration entspricht dem EU-



Illustration 20: Social Media dissemination by H2020 communication (left) and Liebherr (right)

CARRIER

Kühlregal gewinnt ProCold Award



09.03.2017 - Das steckerfertige Kühlregal Optimier Low Front mit Glastüren von Carrier Kältetechnik hat den ProCold Award für das effizienteste Möbel in der Kategorie vertikale Kühlregale erhalten. Der Award wurde auf der EuroShop 2017 in Düsseldorf vergeben.

Illustration 21: Website article about the ProCold Award

Commercial cabinets are natural winners

11 MAR 2017



Illustration 22: Article by coolingpost.com covering the completion and the Award

T6.6 Presentation on national and international events

Each partner participated in national events such as fairs, workshops, stakeholder events etc. The following list reflects where specific ProCold content was presented and disseminated.

Country	Event	Description
Austria	5.4.2016: Alles für den Gast	Project presentation at a national retail fair.
	14.11.2017: Gastmesse Salzburg	Stakeholder visits and booth presentation with Liebherr.
Czech Republic	05.10.2017: Gastro & Hotel	Public Presentation
	25.10.2017: EVVO conference	ProCold information stall
	26.10.2017: 5th Expert Conference	ProCold information stall
France	16.09.2016: SIFA trade show	Project presentation
	October 2016: Pôle Christal	Project presentation
	January 2017: SIRHA	Project presentation, and filmed conference
Germany	28.06.2016: Forum für Gemeinschaftsgastronomie & Catering	Stakeholder Workshop
	10.11.2016: Green Club Index Workshop	Project presentation
	Three presentations at the Federal Ministry for Economic Affairs and Energy	Project presentation
Italy	11.11.2016: GPP event	ProCold criteria were presented
	20.10.2017: HOST Milano	Project presentation
	5.7.2017 Chamber of commerce	Project presentation
Portugal	25.11.2017: VIII Congresso da Fundação Portuguesa do Pulmão	Information stall and project presentation
	25.01.2018: Forum on Education, Development and Citizenship	Project presentation
Sweden	A day about energy efficiency in hotels and conference businesses	Project presentation
	Nordic minister council and energy agencies	Project presentation
	Youth section of Swedish Green Party	Project presentation
Switzerland	01.11.2015: IGEHO 2015	Project presentation
	Meeting Gruppe Gewerbekälte (3x)	Project presentation
	17.-21.11.2017: IGEHO 2017	Information stall
European Events (All)	March 2017: EUROSHOP 2017 Düsseldorf	Project presentation + Award ceremony
	October 2017: HOST Milano	Project presentation

Table 8: List of events at which the ProCold project was presented

T6.7 Website

On the ProCold websites (www.topten.eu/procold and www.pro-cold.eu) general information about the project, the developed tools and product lists were presented throughout the whole project period. Public deliverables have been made accessible on pro-cold.eu and will remain online after the end of the project.

1.2.5.2 Citations on the ProCold project

Though it is not a Deliverable, one of the performance indicators of the ProCold project was a number of citation from governance bodies (from various stakeholders) acknowledging the usefulness of the project. Altogether, we have gathered 32 citations (they are available for EASME on request) and quote the following ones as examples.

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

Bernhard Gut, city of Luzern, is summarizing the results of ProCold

“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 encourages its members to submit products for topten.eu.**

“If you are uncertain which product you should choose for your cooling system, the international initiative ProCold has the goal of helping procurers to select professional plugged-in cold products.” **Gregor Sinnhuber, Austrian professional consultant, recommends 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 program for energy efficient commercial refrigerators and freezers spread to other countries during the ProCold project” **Kurt Bisang, Swiss Federal Office of Energy (SFOE), about the international snowball effect of national ProCold initiatives**

1.2.5.3 Support by national teams

All partners monitored their dissemination efforts and made use of the provided dissemination material: project presentation, brochures, calculation tool, drafts of press releases as well as fact sheets.

All national teams provided their input to reach the overall dissemination goals of WP6. Each team participated in country specific events and addressed the local media as extensively as possible. In

terms of monitoring the effort and the impact, the provided WP6 logbook files were filled in on a regular basis. The provided dissemination material – project presentation, brochures, calculation tool, drafts of press releases as well as fact sheets – was used and national versions were created when needed.

Milestones

Milestone 1 "**Delivery of a market situation report**" was completed on time during the first reporting period.

Milestone 2 "**Involvement of central level market**" was completed on time and grew in the second half of the project. Many central level manufacturers collaborate with ProCold, deliver product declarations and improve their range of products, which showed in the growing lists displayed on Topten. Also the involvement of food and beverage industry grew.

Milestone 3 "**Involvement of national level market players**" was completed on time and grew in the second half of the project. The fulfilment differed according to the stakeholder type, depending on the role of individual stakeholder types in the national economy (e.g. service companies are not always active in recommending new products or public authorities do not always rent space for ProCold type of appliances). Partners in 8 countries have contacted and involved the most important players manufacturing or using professional and commercial plug-in cold products. Overall 1 195 organisations were contacted.

Milestone 4 "**Product competition**" was completed. Manufacturers proposed competing products for each of the 5 product categories open to the competition, laboratories were selected, tests were undertaken and a winning appliance was identified in each category.

Milestone 5 "**Stakeholders awareness raising**" was completed on time and grew in the second half of the project especially with the start of the product competition. All partners have contributed to the dissemination, participating in fairs, presenting the ProCold project, contacting the professional press and succeeding in being published.

Final review of deliverables

	Deliverable	Leader partners	Delivery Month	On time	Why
D.2.5	BAT product lists	Bush Energie	36	yes	Await end of action to include all results
D3.2	Empowering public authorities	Bush Energie	20	Yes	
D3.3	Report on negotiating with manufacturers	Bush Energie	36	No	Await end of action to include all results
D3.5	Report on negotiating with food and beverage industry	Bush Energie	36	No	Await end of action to include all results
D3.7	Report on negotiating with retailers and large direct users	Bush Energie	36	No	Await end of action to include all results

D4.2	National involvement of public authorities public summary	SEVEn & partners	36	No	Await end of action to include all results
D4.4	National involvement of public authorities confidential full report	SEVEn & partners	36	No	Await end of action to include all results
D4.6	National involvement of service companies public summary	SEVEn & partners	36	No	Await end of action to include all results
D4.8	National involvement of service companies full confidential report	SEVEn & partners	36	No	Await end of action to include all results
D5.2	Competition results	OEKO OEKO and ADEME, BushEnergie	26	No	Due to the initial delay of the competition (mostly due to postponed legislation) and decision to do award ceremony at Euroshop. Winners were announced on time; detailed report delayed.
D5.4	Analysis and overview of lab reports	OEKO and ADEME, BushEnergie	24	No	Due to the initial delay of the competition (mostly due to postponed legislation) and decision to do award ceremony at Euroshop the whole competition timeline was moved backwards. Lab reports were evaluated in month 25; report delayed.
D6.	Press releases	AEA	36	No	
D6.5	Specific competition dissemination	AEA & OEKO	26	No	Due to the initial delay of the competition, the whole competition timeline was moved backwards
D6.6	National events (2 per country)	AEA and partners	36	No	Await end of action to include all results
D6.7	International events	AEA and partners	36	No	Await end of action to include all results
6.9	Final publishable report	ADEME	36	Yes – in a certain way	It is impossible to write the publishable report before the end of the project Constraint of Sygma: only deadlines within the project duration are accepted

1.3 Impact

Savings' calculations below and presented in Appendices 3A and 3B in detail are based on the savings per product over its operation period and the estimated amount of sales where best available technology (BAT) models were chosen over standard models thanks to ProCold activities. Technical innovations and advancements caused by project activities were taken into account, whereas – due to difficulty in appraisal – the savings due to project policy recommendations that impacted regulations were not considered (though they for sure play a role in the overall improvements). Policy recommendations are presented in Appendix 6.

The calculations show that between 2015 and 2017 approximately 37 573 additional BAT models were sold instead of standard models because of ProCold activities. This equals to 355 GWh energy savings for the same time period over the operation phase of the products. With a conversion from electric energy to primary energy, this is the equivalent of yearly primary energy savings triggered by the project of 296 GWh.

2 Update of the plan for exploitation and dissemination of result (if applicable)

Not applicable.

3 Update of the data management plan (if applicable)

Not applicable.

4 Follow-up of recommendations and comments from previous review(s) (if applicable)

Unfortunately, the final version of the second amendment request was submitted 1 day after the project end because of a misunderstanding of the rules. For this reason it was impossible to "Change (from) the maximum grant amount" back to the initial amount (i.e. before the 1st amendment). Subcontracting costs of POLIMI should have gone back under staff costs, which should have increased the total budget by 25% on staff cost proportionally.

As requested by the financial officer the request of amendment was cancelled and POLIMI will make the usually budget shifts justified and explained back to the initial budget (see chapter 5.2)

Please address the below comments for the specified deliverables when submitting the next periodic report.

- D2.1: EASME requests that the excel tables containing the calculations made in Table 3 are sent to us.
→ The excel sheet is added as an appendix of D2.1 as requested
- D3.5: For the 2nd version of this deliverable, please report further on efforts to contact manufacturers that have only partly taken place (no answer has been received from 28% of all contacts with manufacturers, as stated in the deliverable).
→ The definition of the "partly" and "fully" contacted stakeholders has been detailed in WP3 and WP4 above (both actually mean the good / qualified contact was reached).
- D3.7: Please clarify why reference is made to 5 food and beverage industry at EU-level (4 fully, 1 partly), while in D3.9 it is stated that no meetings have taken place. If rectification is needed in D3.7, let me know and I'll reopen it in the portal.
→ This was due to an interval between the writing of the Deliverable and the writing of the interim report. The numbers in this report are synchronised with the numbers in the deliverables covering stakeholders.

5 Deviations from Annex 1 and Annexe 2

5.1 Tasks

All tasks are fully implemented. There were only some tasks shifted within the timeline (see explanations hereunder)

Work Package 1 - ADEME

- Task 1.1. Administrative and Financial Management: The 2nd report (interim) was delayed due to a need of several amendments because of unforeseen changes in the national and EC rules
- Task 1.2. Internal Communications: No deviation.
- Task 1.3. Organisation of Project Meetings: No deviation.

Work Package 2 - Bush Energie

- Task 2.3. Monitoring of market developments: The report was postponed until the end of action to make it possible to include all actions until taken within the ProCold project period.

Work package 3 - Bush Energie

- Task 3.1. Empowering public authorities: No deviation.
- Task 3.2. Manufacturers and offers of products: No deviation.
- Task 3.3. Food and beverage industry – large-scale procurement: No deviation.
- Task 3.4. Retailers and other large direct users – how to demand more efficient models: No deviation.

Work Package 4 - SEVEN

- Task 4.1. Public authorities – empowering and adapting strong policies: No deviation.
- Task 4.2. Manufacturers – motivating to offer even more efficient models: No deviation.
- Task 4.3. Food and beverage industry – procuring and using efficient models: No deviation.
- Task 4.4. Service providers – increasing the role in efficient model selection: No deviation.
- Task 4.5. Retailers and other direct users (hotels and restaurants) – how to demand more efficient models: No deviation.

Work Package 5 – OEKO and AEA

- Task 5.1. Organisation of the product competition, defining categories and inviting manufacturers (OEKO): No further deviation (other than reported in interim report).
- Task 5.2. Product testing for compliance verification (AEA): No deviation. Additional tests were performed a) to complement testing of officially submitted models and b) help answer additional questions; the latter test was implemented towards the end of the project based on the budget still available for testing.
- Task 5.3 And the winner is ... (OEKO): No deviation.

Work Package 6 – AEA and ADEME

- Task 6.1. Transferring technical knowledge (AEA): No deviation.
- Task 6.4. Press releases, articles and press coverage (AEA): No deviation.

- Task 6.5. Dissemination product competition (AEA): No deviation.
- Task 6.6. Presentation on national and international events (AEA): No deviation.
- Task 6.7. Website (AEA and ADEME): No deviation.
- Task 6.8. Publishable report (ADEME): No deviation.

5.2 Use of resources

ADEME

ADEME remained in the frame of the foreseen person-month per WP except for:

WP1

ADEME spent 0,71 more person-months than planned on WP 1. The interim report turned out to be extremely time consuming due to need of several amendments. Rules changed on both sides: partner (Italy) and commission (SME). The process (amendments and possible re-submission of the report) was only completed nearly 10 months after the initial deadline. In total four amendments were needed.

WP4 & WP6

The expert working part time, has led to a lower number of activities -the meetings and discussion with the various stakeholders as initially planned. Therefore, ADEME underspent slightly the number of person-months by on WP 4 (-0,04) and WP6 (-0,07).

ADEME Valbonne office is decentralized in France; therefore, travel budget was required to meet stakeholders. For this reason, the travel budget was overspent and therefore the budget of other costs by 2 272,12 €.

A minor adjustment to travel costs of the first reporting period was made due to a modification of the internal rules.

AEA

WP1

0,74 person-months more than intended were spent on WP1. After the project lead was transferred from Bernd Schäppi to Christof Horvath (joint AEA in July 2015), knowledge transfer and specific guidance over the total project period were continuously practiced to constantly improve the high quality. Internal meetings and double checking of the produced documents ensured the good quality work.

WP4

The deviation of 1,13 person-months can be explained by the initiation of the Austrian rebate programme. This was not foreseen at the beginning of the project and was developed fully based on ProCold inputs and content. To ensure that the start and the first year of the rebate programme were successful, extra effort was spent on this issue. AEA received many rebate requests, which had to be worked on in parallel to the regular project work. The outcome of this extra effort resulted in

1.000+ additional sales of Best Available Technology (BAT) products in the year 2017 (first year of the rebate programme), which significantly affected the Austrian market in a positive way.

WP6

Alongside with the efforts of WP4, where the rebate programme was implemented and supported with technical expertise, within WP6 extra efforts were spent on providing the best dissemination support for the rebate programme on a national level. Together with the national institution financing the rebate programme, a factsheet was produced which was spread through the AEA network to reach as many stakeholders as possible. Together with the WP4 activities, this ensured the successful start of the rebate programme in Austria.

Bush Energie

WP1: Administration and Project Management

0.54 person-months more were invested than foreseen in the budget. The reason is that coordination needed more efforts than initially expected.

WP2: Status quo and monitoring of market development

3.11 person-months more were invested than foreseen in the budget. The reason is that the monitoring of market developments requires comprehensive research in order to identify the most energy efficient appliances on the market that were then promoted on the platforms www.pro-cold.eu, www.topten.eu and on all national Topten sites. These product lists are the basis for a successful implementation of the project as all work with stakeholders is based on these lists of most energy efficient products. It is valuable for the European Commission when defining BAT values (Best Available Technology), it is valuable for procurers as it helps them choose the best products and it encourages manufacturers to develop better products in order to benefit from Topten. We thus concluded that additional investment in this work package strongly enhances the success of the project.

WP3: Empowering market players at central level and support for policy design

An additional 1.63 person-months more than foreseen in the budget were invested in involving market players at a central level and providing support for policy design. The reason is that it proved more difficult than expected to find good contacts in international companies and to establish a good exchange and relationship in order to support them in energy efficiency measures.

WP4: Empowering market players at a national level

A little bit more (0.27 person months more) than foreseen in the budget was invested.

WP5: Product competition for most efficient professional cold models on the European market

0.46 person-months less than foreseen in the budget were invested. The reason is that the differentiation between general technical research and technical support for the product competition was not clearly possible. These 0.46 person months are included in the over investment of WP2 (+3.11 person month).

WP6: Dissemination

About 0.07 person-months more than foreseen in the budget were invested, i.e. nearly in accordance with the budget.

Guide Topten

Over the whole project duration, Guide Topten accumulated less staff costs than planned in the contract, mainly because it enlisted the specialized services of a sub-contractor to approach stakeholders.

Concerning this reporting period:

- There is a slight overspending for WP1 that takes into account the reporting hours used for both the first and this second interim report.
- There is a slightly lower investment in WP2: logically, the main work was done during the first period of the project and less hours were needed to implement the updates of the product lists on-line (except towards the end of the contract because a change in the website was necessary – which also shows in the distribution of other costs).
- There is no deviation concerning WP3 as Guide Topten was active in maintaining contacts with European stakeholders, especially institutional ones.
- Less hours were used for WP4 because Guide Topten decided to use the services of a sub-contractor to identify and qualify further stakeholders at the national level – which turned out to be a much more difficult and time consuming activity than expected.
- There is a slight overspending for WP5. Because Guide Topten has experience in organizing product competitions and events, it provided support and advice to Oeko-Institut and AEA.
- There is a slight deviation concerning WP6 as the communication goals could be reached with less hours planned and with the help of the PR agency.

Please note that even if the hours used are less than planned in the contract (2 110 hours instead of 2 210 hours), the amount in Euros for the staff cost is higher (76 149,9€) than the one planned in the contract (70 269). This is explained by an error made in the budget's proposal concerning the hourly rate of Guide Topten as an SME owner without salary. EASME has agreed, at the moment of the first interim report, to raise this hourly rate to 36,09 Euros (which corresponds to the accepted scale for France).

A large part of the budget planned for travels was not used (3 746,98€ spent out of 8 550€ planned). This and the fewer hours used compensate a great share of the described difference in hourly rate and the use of a subcontractor (see below).

However, it does not fully compensate the difference; as a result, the total cost declared is slightly higher than the one projected in the contract (117 547,35€ spent against 114 273,75€ planned) ; it conveys the real expenses engaged in this project.

Oeko-Institut

Actual time spent on the project exceeds the originally planned time by about 20% (19.1 instead of 15.54 person-months; given a lower hourly rate of personnel on the project than foreseen in the proposal, this effectively resulted in additional direct personnel costs of 5 862,07 EUR). The extra time is mostly due to additional effort required to implement the ProCold product competition. Several factors contributed to the additionally required effort:

- 1) As described in the first interim report, the delayed Ecodesign regulation for commercial refrigeration influenced the timeline and implementation of the ProCold Product Competition. Product definitions and test conditions could not be directly taken from the regulation text and finalized test norms. However, a careful definition was crucial for a fair and unequivocal competition. Hence, a more thorough consultation with the ProCold team and stakeholders was necessary (e.g. preliminary rules with the possibility for external stakeholders to provide feedback) and the timeline had to be adapted. Also, status and timeline of test norms had to be researched and considered.
- 2) Additional tests outside the direct competition were performed with two appliances; these required extra handling of appliances (e.g. also cross-border movements with customs requirements) as well as agreements and arrangements with test laboratories.
- 3) Another additional test with four additional appliances was implemented towards the end of the project, which required new contractual arrangements with laboratories. New quotations and contracts with test laboratories had to be set up, test objectives and conditions defined, communication with laboratories maintained and results evaluated (e.g. an extra report compiled).

Some of the activities related to the competition did contribute to work packages 3 and 4, e.g. communication with manufacturers and laboratories and were considered there. As a result, however, less time was available for the actual work of meeting stakeholders in WP3 and 4. This had two implications: Work in WP3 and WP4 focussed on reaching stakeholders via e-mail and phone with less physical meetings taking place. Fewer meetings in turn caused less travel expenses than originally budgeted. Beyond the lower than expected travel costs, other specific costs were less than originally foreseen as well (e.g. a partnership with Ecopark Forum at Euroshop resulted in reduced costs for the competition award ceremony).

Given the increased effort necessary to implement the project, especially the product competition, we are requesting a budget shift of the unused travel and other specific costs to personnel cost in the amount of 5 862,07 EUR, which is about 65% of the unused budget for travel and other specific costs.

Polimi

The amendment originally submitted was caused by a restrictive interpretation of art. 6 of the “model grant agreement” regarding the personnel costs declared for staff working under the “assegni di ricerca” contract. The document was published by the EC “Common Legal Support Service” in mid-October 2015. After the changes made in February 2017 in Article 6.2.A.2 of the “model grant agreement”, the declaration of this specific workforce contracts is allowed, as also

stated in the new “Guidance on List of issues applicable to particular countries”, Version 1.4 26 October 2017.

For the above-mentioned reasons, and as requested by the financial officer, the request for the amendment was cancelled and POLIMI uses the initial budget as basis for the cost declaration.

Politecnico di Milano, compared with the original budget, spent more time than expected (2,9 person-months). A detailed explanation is provided below. The staff cost corresponded to the original budget, due to slightly lower personnel rates

- WP1: increased effort (+0,35 person-months). In the first reporting period ProCold had 3 of the 5 project meetings. The extra hours spent are due to the different effort between the two periods, compared to a linear planning. In the second period another project meeting was hosted by Politecnico in Milan.
- WP2: small deviation (overall) due to first period activities. In the first period the D2.5 “Good practice guidance” was translated and redesigned internally. This activity was originally budgeted as external cost (as Other direct costs in Other goods and services).
- WP3: small deviation (overall) due to first period activities. Extra effort in the first project period was caused by the many activities at international level, such as:
 - Several meetings and calls with EFCEM secretary general and president;
 - Meeting with DG GROW representative, 23.10.2015, in Milan;
 - Meeting with Eurovent representatives F. Scuderi and others, 25.10.2016;
 - Project presentation c/o the E.V.A (European vending association) board, 3.5.2016;
 - Calls with ICLEI - Local Governments for Sustainability regarding the inclusion of the ProCold criteria in the international GPP guidelines;
 - with IKEA for including the ProCold criteria in the company procurement guidelines
- WP4: increased effort due to activities in both periods (+ 0.97 MP). Politecnico contacted and met several of the EU and national stakeholders since the first half of the project. Especially with Italian public administrations, this activity is time consuming and could lead to extra effort for reaching the right person, organizing personal meetings, for data exchange and detailed explanations. The extra effort in the first project period was also due to some of the activities at national level, apart from normal contacts and calls:
 - Meeting in Rome with the Ministry of Environment for the inclusion of professional refrigerators in green public procurement decree (successful);
 - Meeting in Rome with the Ministry of Industry promoting a national incentive scheme for professional refrigeration (unsuccessful try);
 - Project presentation to the board of the National association of municipalities, in Milan;
 - Project presentation to the national central procurer (CONSIP) in Rome;
 - Conference calls with manufacturers (EPTA group, Fogal) regarding ProCold criteria;
 - Two visits to fairs: HOST in October 2015, Venditalia in May 2016
 - Official agreement signed between Politecnico and the Regional Association of Municipalities, regarding the use and promotion of ProCold criteria in local procurement (most of the time spent in legal check and contractual issues).

- In month 12, February 2016, the preparation for an event on GPP for Municipalities started, that took place in November 2016. Among other activities, Politecnico submitted a request to a private foundation, Fondazione Cariplo, in order to receive external funding for supporting this activity (the funds received covered external personnel and buffet).

In the second period, the activities planned and prepared in the first period were carried out: the GPP event with ANCI and Topten, a workshop with the Chamber of Commerce, the work with the Ministry of the Environment (conferences) for the finalisation of the MEP in food preparation.

- WP5: (+0.23 person-months) due to the communication with **professional stakeholders and associations** regarding the competition, for a better definition of products and rules
- WP6: (+0.6 MP) justified by the number of events, articles, online articles and press releases significantly higher (5 national events instead of 2, 1 international event, 25 between press releases, articles, ...)

Furthermore, an additional and unforeseen task was carried out by Politecnico in the last months of the project: the metering of cold professional appliances before and after the replacement with more efficient models, thanks to the cooperation with two of the main stakeholders at national level. An additional deliverable was produced for dissemination, describing the work and detailing the results.

SEVEN

SEVEN has underspent its time resources by about 1% which is considered within normal deviation of the work carried out, as all achievements, both in terms of national activities, and the WP4 leadership, have been delivered.

SEVEN has also underspent some travel and other specific costs, due to the national costs for preparation of documents, organization and participation to events etc., this was possible in a more economic manner than expected.

SSNC

SSNC did not deviate from original person-months per work package by any noticeable amount of months/hours. Its hourly rate is lower than the one used when calculating the original budget, which explains the negative deviation in personnel costs, compared to original budget.

Some budget posts have turned out to cost slightly less than originally budgeted and no funds have been used for translation, which has been done in-house when necessary.

WP4 Subcontracting for analysis of national market: spent 8 500€ instead of budget 10 000€.

Quercus

Overall, the total amount of hours worked was slightly higher than planned. Small deviations occurred in WP4 and WP6 due to the efforts expended on relevant stakeholders involvement, which was particularly successful for manufacturers and in dissemination activities.

Quercus actual hourly rate is lower than the one used on the original budget, therefore the personnel costs are lower than provided for in the budget.

The amount foreseen for traveling was underspent because almost all meetings were scheduled together with Topten meetings, which allowed splitting the costs between the two projects. On the other hand, extra efforts were employed on dissemination, communication and on the website updates, which consumed the amount not spent on travelling.

BushEnergie, ADEME and Guide Topten overspent their budget and we ask for a transfer of budget between partners. The overall budget stayed in the limits of the planed budget.

5.2.1 Unforeseen subcontracting

Guide Topten decided to use the services of a sub-contractor to identify and qualify further stakeholders at the national level – which was a much more difficult and time consuming activity than expected, even in the second period of the project. As Guide Topten has no employee, it was necessary to have some help and the use of a subcontractor allowed for professional help on qualifying contacts and making the first contacts with stakeholders that could be potentially interested in ProCold.

ADEME overspent the number of person-month for the administrative coordination (see also the various problems with Sygma mentioned in the interim report) and more support was needed to keep up the high quality of the project. Therefore, subcontracting assistance for the technical coordination was higher than foreseen. The tasks performed by the subcontractor were the same as foreseen. The subcontractor has been selected ensuring the best value for money according to ADEME's internal rules due to its experience in this task and with knowledge of Topten. Any other competitor would have spent a lot of time and money to reach this level of performance.

5.2.2 Unforeseen use of in kind contribution from third party against payment or free of charges (if applicable)

Not applicable

HISTORY OF CHANGES		
VERSION	PUBLICATION DATE	CHANGE
1.0	15.07.2015	Initial version
1.1	08.08.2016	Corrections for MSCA.
1.2	27.03.2017	Modification of Part B for Research Infrastructures (RI) actions to include a table with the resources used to provide access to RI.
2.1 (version of full template)	19.12.2017	Update of part B of the template to include explanations on adjustments to financial statements declared on previous periods.

6. Appendix

A1 – Topten Memo on correct product declaration



Memo on product declaration to Topten

Date: 07 March 2018

From: Eric Bush, Maike Hepp and Sophie Attali

Correct product declaration is the cornerstone of the most important European policy instruments covering products: “Energy Labelling” and “Eco-Design”. It is key for any informed purchase decisions of private consumers or professional procurers and any platforms comparing products like Topten.

Topten displays product data published by manufacturers and puts them in direct comparison. Topten is aware of its responsibility to provide correct data and considers it a key task to display information of the best possible quality.

This memo discusses possible sources of discrepancies in declarations and how to proceed in case of questionable declarations.

Sources of product information

Topten uses product information declared by manufacturers, either on their websites or upon request. Topten specifies in its “Selection Criteria pages” which information has to be provided according to which standards. In the great majority of cases (and otherwise specified) Topten follows European, and when necessary national, legislation and international standards.

This is in line with the procedure of the European Energy labelling (self-declaration by manufacturers).

When screening product data, Topten may encounter discrepancies within the values declared, that raise a doubt on the energy efficiency level.

Discrepancies can be explained by simple printing mistakes. In this case, Topten asks manufacturers to correct such errors immediately – which they usually do as it is a support for them to fulfil their legal duty.

Discrepancies may be explained by different understandings of standards or of EU Regulations: for example, technical complexity may lead to different ways of applying measurement standards and to conflicts (e.g. on defining net volumes). For this type of discrepancies, standards bodies regularly publish amendments to the standards that specify in more detail how standards should be implemented. Likewise, European bodies also regularly produce FAQ documents on Regulations. Topten cannot play an official role

with this respect. It however contributes to improve the knowledge about these difficulties and alerts official bodies on inconsistencies, unclear specifications and details.

Discrepancies may occur because declarations on the energy label and the product fiche are not correct or that test reports seem inconsistent in some points. The responsibility for controlling these declarations falls on the European Member States who assign it to their respective surveillance bodies. Anyone spotting mistakes can report to these surveillance bodies who can officially take measures depending on their national laws: urge manufacturers to correct the data, fine manufacturers, order a ban of the product, etc.

In this context, Topten:

- a. Systematically checks the plausibility of product data
- b. May request test reports (according to international protocols and standards) for critical product categories or specific products
- c. May undertake spot testing. However, testing on a systematic basis of all products is out of scope and far too expensive for Topten. This is the responsibility of official surveillance bodies and manufacturers' associations that want to contribute to levelling the playing field.

It may happen that manufacturers claim some of their competitors declare wrong values with respect to the energy label / product fiche or product information declared by the manufacturer. In this case Topten cannot assume a role of referee or fund testing to clear the issue. However:

- Topten asks the accused manufacturers for his position and offers to correct any mistakes
- In case of disagreement, Topten motivates involved manufacturers to resolve the problem between themselves
- If not successful, Topten may inform manufacturers' associations and/or surveillance bodies of various European countries

Conclusion

Topten supports all efforts of all stakeholders from standard makers and policy makers, associations, manufacturers, test institutes and surveillance bodies to improve correct declarations and fair play on the market. Topten cooperates with projects aiming to improve verification and enforcement activities such as the EEPLIANT project (www.eepliant.eu). Topten does not bear any official or legal responsibility and relies on the existing European regulatory framework based on self-declared product data.

A2 - LOT12 savings lost ProCold calculation EXCEL



ProCold cost calculation of delaying Lot 12 regulations

The original entry in force of the regulation was 2016 (year 0)

after year 8, lifetime end for old appliances

			SAVINGS																	
			base case						additional policies 1						additional policies 2					
lifetime of appliances	year		yearly			cumulated			yearly			cumulated			yearly			cumulated		
			Label	MEPS +	MEPS	Label	MEPS +	MEPS	Label	MEPS +	MEPS	Label	MEPS +	MEPS	Label	MEPS +	MEPS	Label	MEPS +	
			MEPS only	only	label	only	label	only	only	label	only	only	label	only	only	label	only	only	label	
2016	1	0	0,0	0,0	0,0				0,0	0,0	0,0				0,0	0,0	0,0			
2017	2	1	1,8	2,8	3,3	1,8	2,8	3,3	0,2	0,3	0,4	0,2	0,3	0,4	0,5	0,8	1,0	0,5	0,8	
2018	3	2	3,5	5,5	6,5	5,3	8,3	9,8	0,4	0,6	0,7	0,5	0,8	1,1	1,0	1,6	1,9	1,5	2,4	
2019	4	3	5,3	8,3	9,8	10,5	16,5	19,5	0,5	0,8	1,1	1,1	1,7	2,1	1,5	2,4	2,9	3,0	4,8	
2020	5	4	7,0	11,0	13,0	17,5	27,5	32,5	0,7	1,1	1,4	1,8	2,8	3,5	2,0	3,2	3,8	5,0	8,0	
2021	6	5	9,2	13,3	15,8	26,7	40,8	48,3	0,9	1,4	1,7	2,7	4,1	5,2	2,7	3,9	4,7	7,7	11,9	
2022	7	6	11,4	15,6	18,6	38,1	56,4	66,9	1,2	1,6	2,0	3,9	5,7	7,2	3,4	4,6	5,5	11,0	16,5	
2023	8	7	13,6	17,9	21,4	51,7	74,3	88,3	1,4	1,9	2,3	5,3	7,6	9,5	4,0	5,3	6,4	15,1	21,9	
2024	9	8	15,8	20,2	24,2	67,5	94,5	112,5	1,7	2,1	2,6	7,0	9,8	12,1	4,7	6,0	7,2	19,8	27,9	
2025	10	9	18,0	22,5	27,0	85,5	117,0	139,5	1,9	2,4	2,9	8,9	12,2	15,0	5,4	6,8	8,1	25,2	34,7	
2026	11	10	20,2	24,8	29,8	105,7	141,8	169,3	2,1	2,7	3,2	11,0	14,8	18,2	6,1	7,5	9,0	31,3	42,1	
2027	12	11	22,4	27,1	32,6	128,1	168,9	201,9	2,4	2,9	3,5	13,4	17,7	21,7	6,8	8,2	9,8	38,0	50,3	
2028	13	12	24,6	29,4	35,4	152,7	198,3	237,3	2,6	3,2	3,8	16,0	20,9	25,5	7,4	8,9	10,7	45,5	59,2	
2029	14	13	26,8	31,7	38,2	179,5	230,0	275,5	2,9	3,4	4,1	18,9	24,4	29,6	8,1	9,6	11,5	53,6	68,8	
2030	15	14	29,0	34,0	41,0	208,5	264,0	316,5	3,1	3,7	4,4	22,0	28,1	34,0	8,8	10,3	12,4	62,4	79,1	

In red source data, see Notes

In green cumulated savings lost in 2020 and 30, if the regulation started in 2016

SAVINGS per year			base+additional1 in 2024 (after 8 years)		
	17,5	22,3	26,8		
base+additional2 in 2024					
	20,5	26,2	31,4		
base +add1+add2 in 2024					
	22,2	28,4	34,0	= 1,7 times the total electric consumption of Paris (see Notes for source)	
			Or	8 510 000	of dwellings consuming 4'000 kWh
			Or	4 600 000	of per capita energy consumption of french inhabitants

1 TWh 1'000'000'000 kWh

1100 909091 yearly domestic consumption per person

4000 250000 dwellings

7400 135135 overall consumption per capita

Table 8.2 Estimation of the total potential energy savings in 2020 and 2030 by the use of ecodesign scenarios (MEPS only, Label only, Label +MEPS), compared to the reference Business as Usual (BAU) scenario.

TOTAL POTENTIAL SAVINGS COMPARED TO BAU - base cases only				
		MEPS only	LABEL only	MEPS+LABEL
2020	TWh/yr	-7	-11	-13
	%	-12%	-19%	-23%
2030	TWh/yr	-29	-34	-41
	%	-46%	-54%	-66%
Additional potential savings all other (non base-case) supermarket remote cabinets:				
2020	TWh/yr	-0.7	-1.1	-1.4
2030	TWh/yr	-3.1	-3.7	-4.4
Additional potential savings all other (non base-case) supermarket plugin cabinets:				
2020	TWh/yr	-2	-3.2	-3.8
2030	TWh/yr	-8.8	-10.3	-12.4

Data taken from updated JRC study, page 139

As you can see, the expected savings are calculated as yearly savings in 2020 and 2030

Source: Ecodesign for Commercial Refrigeration

Hans Moons, Alejandro Villanueva, Maria Calero, Fulvio Ardente, Fabrice Mathieux, Nicola Labanca, Paolo Bertoldi, Oliver Wolf
Preparatory study update, Final report, 2014

Assumptions made in this model:

The average lifetime is 8 years (as suggested by colleagues)

The stock is renewed with a constant rate, so every year we save the same amount of new products (inbetween now->2020 and 2021->2030)

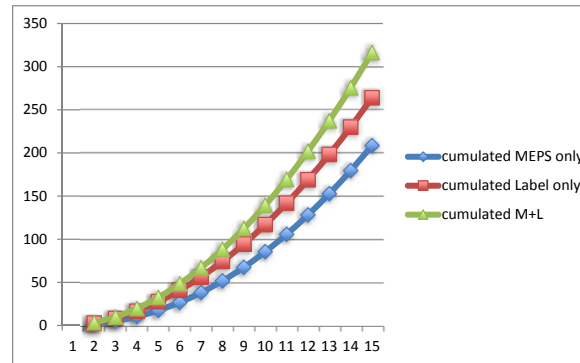
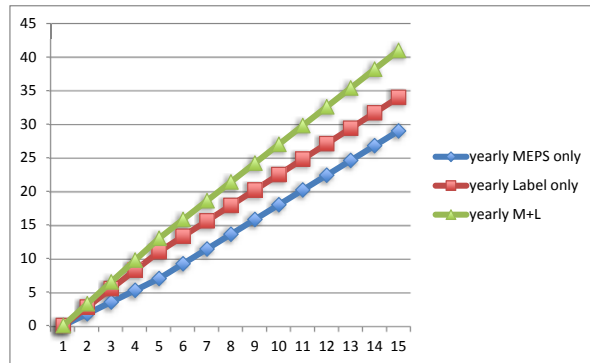
Ville de Paris consumption data

total	43,9 TWh/y
electric	46%
	20,2 TWh/y
source	http://api-site-cdn.paris.fr/images/71122

cells in yellow are JRC data

red is saving losses (lifetime 8 years)

			base									additional 1									additional 2								
			yearly			cumulated			yearly			cumulated			yearly			cumulated											
pot sav / year	pot sav / year	lifetime	year	MEPS only	Label only	M+L	MEPS only	Label only	M+L	year	MEPS only	Label only	M+L	MEPS only	Label only	M+L	year	MEPS only	Label only	M+L	MEPS only	Label only	M+L						
2016	2017	1	0	0	0	0				0	0	0	0				0	0	0	0									
2017	2018	2	1	1,8	2,8	3,3	1,8	2,8	3,3	1	0,2	0,3	0,4	0,2	0,3	0,4	1	0,5	0,8	1,0	0,5	0,8	1,0						
2018	2019	3	2	3,5	5,5	6,5	5,3	8,3	9,8	2	0,4	0,6	0,7	0,5	0,8	1,1	2	1,0	1,6	1,9	1,5	2,4	2,9						
2019	2020	4	3	5,3	8,3	9,8	10,5	16,5	19,5	3	0,5	0,8	1,1	1,1	1,7	2,1	3	1,5	2,4	2,9	3,0	4,8	5,7						
2020	2021	5	4	7	11	13	17,5	27,5	32,5	4	0,7	1,1	1,4	1,8	2,8	3,5	4	2	3,2	3,8	5,0	8,0	9,5						
2021	2022	6	5	9,2	13,3	15,8	26,7	40,8	48,3	5	0,9	1,4	1,7	2,7	4,1	5,2	5	2,7	3,9	4,7	7,7	11,9	14,2						
2022	2023	7	6	11,4	15,6	18,6	38,1	56,4	66,9	6	1,2	1,6	2,0	3,9	5,7	7,2	6	3,4	4,6	5,5	11,0	16,5	19,7						
2023	2024	8	7	13,6	17,9	21,4	51,7	74,3	88,3	7	1,4	1,9	2,3	5,3	7,6	9,5	7	4,0	5,3	6,4	15,1	21,9	26,1						
2024	2025	9	8	15,8	20,2	24,2	67,5	94,5	112,5	8	1,7	2,1	2,6	7,0	9,8	12,1	8	4,7	6,0	7,2	19,8	27,9	33,3						
2025	2026	10	9	18,0	22,5	27,0	85,5	117,0	139,5	9	1,9	2,4	2,9	8,9	12,2	15,0	9	5,4	6,8	8,1	25,2	34,7	41,4						
2026	2027		10	20,2	24,8	29,8	105,7	141,8	169,3	10	2,1	2,7	3,2	11,0	14,8	18,2	10	6,1	7,5	9,0	31,3	42,1	50,4						
2027	2028		11	22,4	27,1	32,6	128,1	168,9	201,9	11	2,4	2,9	3,5	13,4	17,7	21,7	11	6,8	8,2	9,8	38,0	50,3	60,2						
2028	2029		12	24,6	29,4	35,4	152,7	198,3	237,3	12	2,6	3,2	3,8	16,0	20,9	25,5	12	7,4	8,9	10,7	45,5	59,2	70,9						
2029	2030		13	26,8	31,7	38,2	179,5	230,0	275,5	13	2,9	3,4	4,1	18,9	24,4	29,6	13	8,1	9,6	11,5	53,6	68,8	82,4						
2030	2031		14	29	34	41	208,5	264,0	316,5	14	3,1	3,7	4,4	22,0	28,1	34,0	14	8,8	10,3	12,4	62,4	79,1	94,8						



A3A – Project Savings final



DIRECT SAVINGS IN ENERGY CONSUMPTION THROUGH THE PROCOLD PROJECT

Work package WP2: Energy savings realized through the ProCold project

Task 2.1: Saving Potentials

Maike Hepp, Bush Energie GmbH, Switzerland

31 January 2018

Project Partners



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INTRODUCTION

About this project

ProCold is a European project in the framework of Horizon 2020, supporting the development and market penetration of energy efficient commercial refrigeration equipment. The project aims at stimulating both the supply and demand side market for environmentally friendly efficient technology by various market oriented services, including among others a web-based product database for efficient products, procurement guidelines and tools and a product competition. The project is implemented in 8 countries (DE, FR, CH, IT, CZ, PT, SE, AT).

This document calculates the direct savings that can be directly contributed to the actions of the ProCold project. Calculations are based on the savings per product over its operation period and the estimated amount of sales where best available technology models (BAT models) were chosen over standard models because of ProCold activities. Taken into account are technical innovations and advancements caused by ProCold activities. Not taken into account – due to difficulty in appraisal – are savings due to ProCold policy recommendations that impacted regulations.

OVERVIEW PRODUCT CATEGORIES, SALES, CONSUMPTION

Table 1 shows the sales for six main product categories in the EU and in the combined 8 ProCold partner countries. These numbers are used to estimate the minimal savings that were brought by the ProCold project. ProCold triggered almost 40'000 additional BAT sales (BAT – best available technology – meaning energy efficient products with climate-friendly refrigerant). The biggest number of optimized procurement was achieved by working together with the beverage industry (13'000 additional units that meet the ProCold criteria).

Product group	All Sales EU 2015	All Sales EU 2016	All Sales EU 2017	All Sales EU 2015- 2017	All Sales in Project Countries 2015-2017	0.85%- 0.87% of Sales in Project Countries	0.16% of Sales Rest of EU	Additio- nal BAT Sales due to ProCold
	units	units	units	units	units	units	units	units
Plug-in refrigerated display cabinets ¹	218'604	219'129	219'655	657'389	324'823	2'783	532	3'315
Beverage coolers	872'409	879'039	885'720	2'637'168	1'303'054	11'163	2135	13'298
Ice cream freezers	373'549	377'074	379'422	1'130'044	558'368	4'784	915	5'699
Refrigerated vending machines	163'502	159'716	155'877	479'095	236'726	670	126	796
Refrigerated storage cabinets	424'521	427'663	430'805	1'282'989	633'939	5'431	1039	6'470
Minibars	344'586	347'205	349'844	1'041'635	514'684	4'409	843	5'252
Wine storage appliances	180'000	181'368	182'746	544'114	268'853	2'303	440	2'743
Sum	7'772'434				3'840'447	37'573		
	100%				49%	0.5%		

¹ including supermarket, serve-over and self-service cabinets

Table 1: Sales of seven product categories in the EU for 2015-2017 and focus on the ProCold project (table from Grant Agreement, updated with data for wine storage appliances and % of sales)

Data reliability: The eight participating countries (Austria, Czech Republic, France, Germany, Italy, Portugal, Sweden and Switzerland) account for 49% of EU28+CH population (Eurostat for year 2013). We assume that EU sales distribute proportional to countries' population.

In the grant agreement an increase of 0.8% of sales in BAT models chosen over standard models because of ProCold activities was anticipated in the participating countries and 0.15% in other EU countries due to targeted actors operating internationally. Measured results have exceeded expectations significantly. In Switzerland alone – the smallest of the participating countries – almost 6000 BAT product sales due to ProCold were registered within the scope of the Swiss rebate programme for energy efficient commercial and professional refrigeration appliances, resulting in almost 55 GWh of energy savings over their operation phase. Within this highly successful rebate programme that was initiated as part of ProCold, ProKilowatt from the Swiss Federal Office of Energy adopted the Topten selection criteria and thus strengthened the effect of the project. Initially projected savings were exceeded by 30%, showing how eagerly the market has taken to increased efficiency in technologies. This in turn influenced the entire Swiss market as manufacturers developed new efficient technologies in order to be admitted in the rebate programme – technologies that are not only spreading across Switzerland but all over Europe. This results in further sales of BAT products in Switzerland – a spill-over effect that improved the market in general but could not be declared and measured in the rebate programme – and all of Europe.

Austria copied the Swiss rebate programme as an action within the ProCold project and started their own rebate programme in January 2017; this again strengthened the influence on the European product range. As a result, calculations in table 1 reflect this positive development by applying the factors 0.85% for 2015 and 2016 (Swiss rebate programme which stated at the beginning of ProCold), 0.87% for 2017 (Swiss and Austrian rebate programmes) and 0.16% for the rest of Europe for all three years (Swiss rebate programme since the beginning of ProCold and Austrian rebate programme since January 2017).

The list for vending machines on Topten was published at the beginning of 2017. As such, an influence on sales of vending machines for all countries was only assumed for 2017 and the total number adjusted accordingly. Here the ProCold competition "Best European Product" winner in March 2017 has brought technical innovation to the market – to cite the manufacturer *"In order to avoid cold and heat transfer, the sealing of the complete chilled area in the Robimat XM has been improved. By changing the refrigerant to R744 (CO2) with a GWP-value of 1.0, the efficiency of the cooling has been increased by 5 %, which is relatively an improvement by 8.9 % (when compared to using R134a). Furthermore, the Robimat XM also demonstrates exceptional recycling capability."*

In addition to the categories listed in the Grant Agreement, wine storage appliances with one and multiple temperature zones were added, meaning more product categories were covered by ProCold activities and more efficient models were listed and sold.

Original values for the column “0.15 % of Sales rest of EU” in the table in the Grant Agreement were undervalued due to a calculation error². The correct values adjusted to 0.16 % are shown above in table 1.

SAVINGS REALIZED BY PROJECT ACTIONS

Table 2 shows the calculation of saving potentials for each product group for each year. Increase in BAT sales are based on sales of products in the EU listed in table 1, applying the same assumptions to distribution between the ProCold countries and rest of EU, as well as the assumptions about the percentage of additional BAT sales due to ProCold as listed in table 1:

- 49 % of sales in project countries
- Sales due to ProCold actions for project countries 0.85 % (for 2015/16) / 0.87 % (for 2017) of sales for project countries and 0.16 % for rest EU
- Vending machines on Topten since 2017

Energy savings for a single product (reference model vs. BAT model) are taken from table 3 taking into account tightening of the Topten selection criteria over the duration of the project.

Product category		Energy savings BAT vs. Ref. for a single product	Additional BAT sales due to ProCold	Energy savings due to additional BAT sales
		kWh/ operation phase ³	units	GWh/ product operation phase ³
Plug-in refrigerated display cabinets	2015	29'024	1'095	31.8
	2016		1'098	31.9
	2017		1'122	32.6
Beverage coolers	2015	10'952	4'370	47.9
	2016	10'952	4'403	48.2
	2017	15'336	4'524	69.4
Ice cream freezers	2015	2'642	1'871	4.9
	2016	2'642	1'889	5.0
	2017	5'284	1'938	10.2
Refrigerated vending machines	2015	5'506	0	0
	2016		0	0
	2017		796	4.4
Refrigerated storage cabinets	2015	8'060.8	2'127	17.1
	2016	9'209.5	2'142	19.7
	2017	9'491.6	2'201	20.9
Minibars	2015	1'470	1'726	2.5
	2016		2'739	2.6
	2017		1'787	2.6
Wine storage appliances	2015	1'320	902	1.2
	2016		909	1.2
	2017		933	1.2
Sum			37'573	355.3

Table 2: Calculation of savings per product category for all three years

² Due to a small error in the factor for the calculation of the “0.15% of Sales in the Rest of the EU”, the overall BAT sales due to ProCold were slightly underestimated in the original table (in the Grant Agreement)

³ cf. table 3 for length of operation phase for each product category

The table shows that between 2015 and 2017 approximately 37'573 additional BAT models were sold instead of standard models because of ProCold activities. This equals to 355 GWh energy savings for the same time period over the operation phase of the products (8 to 10 years depending on the product category as shown in table 3).

Initial calculations in the Grant Agreement projected electricity savings of 331 GWh for 31'283 BAT additional BAT models. The final post-project calculations reflect an additional 20% of sales for BAT units and 7% higher electricity savings, indicating that not only were the total savings caused by ProCold initially underestimated but the savings per category were initially overestimated. This difference stems from the discrepancy between original assumptions and real developments and will be explained for each category below. A detailed description of the realized savings for each product category is added to table 3.

Product category	Reference models		Energy efficiency index		Annual energy consumption				Energy savings for a single product
	Net Volume	Total Display Area	Ref.	BAT ⁴	Ref.	BAT	Saving potential	Operation phase ⁵	BAT vs. Ref.
	litres	m2			kWh/year	kWh/year		years	kWh/operation phase
Plug-in refrigerated display cabinets	2015	1.4	100	50	7'256	3'628	50%	8	29'024
	2016								
	2017								
Beverage coolers	2015	500	100	50	2'738	1'369	50%	8	10'952
	2016			50		1'369	50%		10'952
	2017			30		821	70%		15'336
Ice cream freezers	2015	291	100	75	1'321	991	25%	8	2'642
	2016			75		991	25%		2'642
	2017			50		661	50%		5'284
Refrigerated vending machines	2015	750	100	75	2'591	1'943	25%	8.5	5'506
	2016								
	2017								
Refrigerated storage cabinets	2015	450	100	60	2'519	1'511	40%	8	8'060.8
	2016			54.3		1'368	46%		9'209.5
	2017			52.9		1'333	47%		9'491.6
Minibars	2015	40	100	42	254	107	58%	10	1'470
	2016								
	2017								
Wine storage appliances	2015	200	100	55	292	160	45%	10	1'320
	2016								
	2017								

Table 3: Calculation of saving potentials for each product group (table from Grant Agreement updated to include minibars, wine storage appliances and to reflect developments in the Topten selection criteria over project duration)

Projected energy savings in the Grant Agreement were calculated based on sales data from EC's preparatory studies⁶, labelling formulas according to the current EU

⁴ Taking into account the tightening of Topten selection criteria over the project duration

⁵ Operation phases for each product category are conservative estimates

⁶ 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.

policy documents (adapted or most recent draft available as of late May 2014) and current test standards of the same time. Final post-project calculations reflect the current EU policy documents and test standards (as of February 2018). Resulting changes due to different calculations for EEI or different measurements of test standards are one reason for discrepancies between projected savings per product category.

A second factor are the Topten selection criteria and availability of best available technology on the market. While for some categories the energy efficiency index (EEI) for BAT products turned out to be too optimistic – scarce availability on the market –, some selection criteria were tightened during the project, leading to increased energy savings for the categories. Product categories where saving potentials were initially overestimated are ice-cream freezers, refrigerated vending machines and refrigerated storage cabinets. For plug-in refrigerated display cabinets, minibars and wine storage appliances the projected savings were accurate while for beverage coolers the selection criteria could be tightened even further, resulting in higher savings starting in 2017.

Ice-cream freezers: EN 16901:2016 became available in December 2016 and officially replaced prEN 16901:2015. While data did not significantly differ from prEN to EN, the availability of BAT models on the market with a draft EEI⁷ of 40 predicted in the Grant Agreement turned out to be overly optimistic. Best products on the market 2015 and 2016 lead to an adjustment of the selection criteria to draft EEI=75; the energy savings potential for a single product of this product category was reduced accordingly. Due to technical advancements, the selection criteria could be tightened to draft EEI=50 in 2017, but realized savings stayed behind expectations from the Grant Agreement.

Refrigerated Vending Machines: Energy consumption, reference model and savings in the initial calculations were based on data according to the voluntary EVA label for vending machines and predicted a saving potential of 60%. The list published on Topten in 2017 contains data based on EN 50597:2015, resulting in different energy consumption and draft EEI values for reference and BAT models. Combined with the availability of BAT models on the market this resulted in energy savings of 25% for this list. Projected energy savings in this category are also reduced because the Topten list for vending machines was published in 2017 (no savings effect for 2015 and 2016).

Refrigerated storage cabinets: the EEI of the BAT models is calculated as average from the selection criteria for the 7 subcategories counter refrigerators, refrigerators 1-door, refrigerators 2-doors, counter freezers, freezers 1-door, freezers 2-doors and refrigerator-freezers. In May 2015, the final versions of the EU labelling and ecodesign regulations for professional refrigeration storage cabinets were adopted and on 1st July 2016 the EU energy label and the first stage of minimum requirements came in effect. An overestimation for BAT products at the start of ProCold resulted in a too high calculation of the projected saving potential. The introduction of the regulation triggered a rapid development in efficient technologies as a result of which the Topten selection criteria could be tightened several times in the duration of the project. This way the saving potential for refrigerated storage cabinets increased from 40% in 2015 to 47% in 2017. By November 2017 the selection criteria could be tightened once again, resulting in a saving potential of 52.1% by the end of the project. Since 01.01.2018 the second

⁷ All references to EEIs with regards to commercial refrigerated display cabinets (ice-cream freezers, beverage coolers, plug-in refrigerated display cabinets, vending machines) mean a draft EEI as calculated with the categories and M and N values from the 2014 working documents

stage of minimum requirements is in effect, banning all class G products (EEI>95) except for heavy-duty products from the market. Until then, models with an EEI up to 115 were allowed on the market.

Plug-in refrigerated display cabinets: while EN ISO 23953 was updated in 2015, no significant change in available product data resulted. Policy for ecodesign and labelling regulation for commercial refrigerated display cabinets did not move forward from 2015 to 2017 and selection criteria remained constant.

Minibars and wine coolers: covered under EU regulation No 1060/2010 regarding energy labelling of household refrigerating appliances. Minibars and wine coolers for non-household use fall into a gap between the scopes of EU regulation for commercial and household products. As a consequence, it is at the discretion of manufacturers and dealers to apply labelling and ecodesign requirements, or to omit product information for products intended for professional / commercial use. The projected saving potentials were realistic and selection criteria remained constant in the process duration.

Beverage coolers: available EN 16902:2016 data does not significantly differ from prEN16902:2015 product data. BAT models increased in efficiency in 2016 and 2017 so that the selection criteria for beverage coolers could be tightened in 2017 from draft EEI 50 to draft EEI 30, resulting in higher energy savings for this product category.

As a consequence, the electricity savings due to ProCold are only 7% higher than projected while the number of additional BAT sales instead of regular product sales due to ProCold is 20% higher than originally projected.

As a project performance indicator, primary energy savings within one year triggered by ProCold actions are calculated in table 4. The post-project analysis and calculation document yearly primary energy savings triggered by ProCold of 296 GWh instead of the 276 GWh/year assumed before the project.

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
Plug-in 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
Sum	355	888	296

Table 4: Overview of calculated primary energy savings triggered by ProCold (conversion from electric energy to primary energy with default coefficient of 2.5)

The ProCold Grant Agreement lists 1'181'780 € as estimated eligible costs of the ProCold action. With the primary energy savings triggered within one year listed in table 4, this results in **250.6 GWh/year per million €** over the operation phase of the products.

SUMMARY

Table 5 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 in the post-project period.

	# BAT sales triggered by project (units)	Energy savings for 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
Realized 2018	37'573	355	888	296

Table 5 Differences in BAT Products, Manufacturers and Categories from the Beginning to End of the ProCold Project

In general, the savings are calculated very conservatively considering that the savings in Switzerland – the smallest of all project countries - due to the rebate programme alone account for 1/6 of all calculated savings in BAT sales and energy savings and that not even all savings triggered in Switzerland were covered by the data documented with the rebate programme: only product purchases registered for the rebate programme were documented, while companies adopting Topten selection criteria into their procurement criteria and the spill-over effect of manufacturers developing new efficient technologies for the rebate programme and thus improving the market in general was not included in those numbers. The real number of BAT sales triggered and energy savings likely exceeds these calculation results significantly.

ADDITIONAL FACTS ABOUT PROCOLD

ProCold is a European project designed to support the market development for energy efficient commercial refrigeration equipment. The project is funded in the framework of the Horizon 2020 programme.

Project Coordination:

ADEME, French Agency for Environment and Energy Management

Project Partners:

Austria: Austrian Energy Agency, AEA

Czech Republic: 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

Project duration:

01.02.2015 – 31.01.2018

REFERENCES

- [1] Draft energy label and Ecodesign regulation DG ENER Lot 12 refrigerated commercial display cabinets (September 2015); detailed graphs for different product types showing the label classes, Tier 1 and Tier 2.
- [2] Commission Delegated Regulation (EU) No 1060/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household refrigerating appliances
- [3] Commission Regulation (EC) No 643/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household refrigerating appliances
- [4] Interim report, Ecodesign & Labelling Review Household Refrigeration, June 2015, prepared by VHK and ARMINES for the European Commission, www.ecodesign-fridges.eu
- [5] Commission delegated regulation (EU) 2015/1094 of 5 May 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of professional refrigerated storage cabinets
- [6] Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers
- [7] Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006
- [8] ProCold website www.topten.eu/pro-cold
 - Product lists 'Professional Refrigerators' with top-efficient commercial and professional products using green refrigerants

A3B – Project savings Excel

2015										cf. Sheet "BAT sales per year"											
Product category	Reference models		Energy efficiency index		Annual energy consumption		Saving potential	Operation phase*	Energy savings BAT vs. Ref. For a single product	All Sales EU 2015	Additional BAT sales 2015 due to ProCold	Energy savings due to additional BAT sales (in kWh)	Energy savings due to additional BAT sales (in GWh)	Primary Energy savings triggered			Primary energy savings triggered by ProCold with 1181780 € project funding				
	Net Volume	Total Display Area	Ref.	BAT	Ref.	BAT								Electricity savings triggered within project duration	Primary energy savings triggered within project	Primary energy savings triggered within one year					
	litres	m ²			kWh/year	kWh/year	CHECK	years	with %	units		kWh/operation phase	GWh/operation phase		GWh/product operation phase	GWh/3 years*	GWh/year*				
Plug-in refrigerated display cabinets		1,4	100	50	7256	3628	50%	8	29024	218604	1095	31781280	31,8	96	241	80					
Beverage coolers	500		100	50	2738	1369	50%	8	10952	872409	4370	47860240	47,9	165	414	138					
Ice cream freezers	291		100	75	1321	991	25%	8	2642	373549	1871	4943182	4,9	20	50	17					
Refrigerated vending machines	750		100	75	2591	1943	25%	8,5	5505,9	163502	0	0	0,0	4	11	4					
Refrigerated storage cabinets	450		100	60	2519	1511	40%	8	8060,8	424521	2127	17145321,6	17,1	58	144	48					
Minibars	40		100	42	254	107	58%	10	1470	344586	1726	2537220	2,5	8	19	6					
Wine storage appliances	200		100	55	292	160	45%	10	1320	180000	902	1190640	1,2	4	9	3					
Table 4: Specifications of reference and BAT models (table from Grant Agreement updated for minibars and wine storage appliances)										Table 2: Sales of seven product categories in the EU and target of the ProCold project (table from Grant Agreement updated with data for wine storage appliances)				105,5	355	888	296	250,6			
2016																		* calculated over the operation phase of the products			
Product category	Reference models		Energy efficiency index		Annual energy consumption		Saving potential	Operation phase*	Energy savings BAT vs. Ref. For a single product	All Sales EU 2016	Additional BAT sales 2016 due to ProCold	Energy savings due to additional BAT sales (in kWh)	Energy savings due to additional BAT sales (in GWh)	Primary Energy savings triggered			Primary energy savings triggered by ProCold with 1181780 € project funding				
	Net Volume	Total Display Area	Ref.	BAT	Ref.	BAT								Electricity savings triggered within project duration	Primary energy savings triggered within project	Primary energy savings triggered within one year					
	litres	m ²			kWh/year	kWh/year	CHECK	years	with %	units		kWh/operation phase	GWh/operation phase		GWh/product operation phase	GWh/3 years*	GWh/year*				
Plug-in refrigerated display cabinets		1,4	100	50	7256	3628	50%	8	29024	219129	1098	31868352	31,9	96	241	80					
Beverage coolers	500		100	50	2738	1369	50%	8	10952	879039	4403	48221656	48,2	165	414	138					
Ice cream freezers	291		100	75	1321	991	25%	8	2642	377074	1889	4990738	5,0	20	50	17					
Refrigerated vending machines	750		100	75	2591	1943	25%	8,5	5505,875	159716	0	0	0,0	4	11	4					
Refrigerated storage cabinets	450		100	54,3	2519	1368	46%	8	9209,464	427663	2142	19726671,89	19,7	58	144	48					
Minibars	40		100	42	254	107	58%	10	1470	347205	1739	2556330	2,6	8	19	6					
Wine storage appliances	200		100	55	292	160	45%	10	1320	181368	909	1199880	1,2	4	9	3					
Table 4: Specifications of reference and BAT models (table from Grant Agreement updated for minibars and wine storage appliances)										Table 2: Sales of seven product categories in the EU and target of the ProCold project (table from Grant Agreement updated with data for wine storage appliances)				108,6							
2017																					
Product category	Reference models		Energy efficiency index		Annual energy consumption		Saving potential	Operation phase*	Energy savings BAT vs. Ref. For a single product	All Sales EU 2017	Additional BAT sales 2017 due to ProCold	Energy savings due to additional BAT sales (in kWh)	Energy savings due to additional BAT sales (in GWh)	Primary Energy savings triggered			Primary energy savings triggered by ProCold with 1181780 € project funding				
	Net Volume	Total Display Area	Ref.	BAT	Ref.	BAT								Electricity savings triggered within project duration	Primary energy savings triggered within project	Primary energy savings triggered within one year					
	litres	m ²			kWh/year	kWh/year	CHECK	years	with %	units		kWh/operation phase	GWh/operation phase		GWh/product operation phase	GWh/3 years*	GWh/year*				
Plug-in refrigerated display cabinets		1,4	100	50	7256	3628	50%	8	29024	219655	1122	32564928	32,6	96	241	80					
Beverage coolers	500		100	30	2738	821	70%	8	15336	885720	4524	69380064	69,4	165	414	138					
Ice cream freezers	291		100	50	1321	661	50%	8	5284	379422	1938	10240392	10,2	20	50	17					
Refrigerated vending machines	750		100	75	2591	1943	25%	8,5	5506	155877	796	4382676,5	4,4	20	50	17					
Refrigerated storage cabinets	450		100	52,9	2519	1333	47%	8	9401,6	430805	2201	20890993,99	20,9	58	144	48					
Minibars	40		100	42	254	107	58%	10	1470	349844	1767	2626889,0	2,6	8	19	6					
Wine storage appliances	200		100	55	292	160	45%	10	1320	182746	933	1231560	1,2	4	9	3					
Table 4: Specifications of reference and BAT models (table from Grant Agreement updated for minibars and wine storage appliances)										Table 2: Sales of seven product categories in the EU and target of the ProCold project (table from Grant Agreement updated with data for wine storage appliances)				141,3							
										SUM				355,3							
* conservative estimate																					

Product category	All Sales EU 2015	All Sales EU 2016	All Sales EU 2017	All Sales EU 2015-17	All Sales Rest EU	All Sales in Project Countries 2015-17	Sales in Project Countries in %
	units	units	units	units	units	units	
Plug-in refrigerated display cabinets	218604	219129	219655	657388	332565	324823	49,41
Beverage coolers	872409	879039	885720	2637168	1334114	1303054	49,41
Ice cream freezers	373549	377074	379422	1130045	571677	558368	49,41
Refrigerated vending machines	163502	159716	155877	479095	242369	236726	49,41
Refrigerated storage cabinets	424521	427663	430805	1282989	649050	633939	49,41
Minibars	344586	347205	349844	1041635	526951	514684	49,41
Wine storage appliances	180000	181368	182746	544114	275261	268853	49,41
Sum				7772434	3931987	3840447	49,41

0.8% of Sales in Project Countries*	0.15% of Sales Rest of EU*	Sum without adjustments*
units	units	
2599	499	3097
10424	2001	12426
4467	858	5324
1894	364	2257
5072	974	6045
4117	790	4908
2151	413	2564
30724	5898	36622

* With original data from Grant Agreement. Changes calculated below

Product category	All Sales EU 2015	All Sales in Project Countries 2015	All Sales Rest EU 2015	Additional BAT Sales due to ProCold (by year)		
				0.85% of Sales in Project Countries	0.16% of Sales Rest of EU	Total of Additional BAT sales (2015)
	units			units	units	
Plug-in refrigerated display cabinets	218604	108012	110592	918	177	1095
Beverage coolers	872409	431057	441352	3664	706	4370
Ice cream freezers	373549	184571	188978	1569	302	1871
Refrigerated vending machines	163502	80786	82716	687	132	819
Refrigerated storage cabinets	424521	209756	214765	1783	344	2127
Minibars	344586	170260	174326	1447	279	1726
Wine storage appliances	180000	88938	91062	756	146	902
						12910

over all three ProCold years		
Additional BAT Sales in Project Countries	Additional BAT sales rest EU	Additional BAT sales due to project
2783	532	3315
11163	2135	13298
4784	915	5698
670	126	796
5431	1039	6469
4409	843	5252
2303	440	2744
SUM:	SUM:	SUM:
31543	6030	37573

Difference new calculations to original predictions	
original prediction:	
GWh	331
units	31283
realized savings:	
GWh	355
units	37573
Difference:	7,3 % 20,1 %

Product category	All Sales EU 2016	All Sales in Project Countries 2016	All Sales Rest EU 2016	0.85% of Sales in Project Countries	0.16% of Sales Rest of EU	Total of Additional BAT sales (2016)
	units					
Plug-in refrigerated display cabinets	219129	108272	110857	920	177	1098
Beverage coolers	879039	434333	444706	3692	712	4403
Ice cream freezers	377074	186312	190762	1584	305	1889
Refrigerated vending machines	159716	78916	80800	671	129	800
Refrigerated storage cabinets	427663	211308	216355	1796	346	2142
Minibars	347205	171554	175651	1458	281	1739
Wine storage appliances	181368	89614	91754	762	147	909
						12980

Product category	All Sales EU 2017	All Sales in Project Countries 2017	All Sales Rest EU 2017	0.87% of Sales in Project Countries	0.16% of Sales Rest of EU	Total of Additional BAT sales (2017)
	units					
Plug-in refrigerated display cabinets	219655	108532	111123	944	178	1122
Beverage coolers	885720	437634	448086	3807	717	4524
Ice cream freezers	379422	187472	191950	1631	307	1938
Refrigerated vending machines	155877	77019	78858	670	126	796
Refrigerated storage cabinets	430805	212861	217944	1852	349	2201
Minibars	349844	172858	176986	1504	283	1787
Wine storage appliances	182746	90295	92451	786	148	933
						13302
Sum	7772434			SUM		39192

A4 - ProCold Measurement projects in Italy

National involvement of manufacturers and retailers

Field metering campaign for professional cold appliances

Project coordinator: ADEME France

Lead authors for the document: Politecnico di Milano

Date: February 2018

Project partners



The «ProCold» project has received funding from the [European Union's Horizon 2020 research and innovation programme](#) under grant agreement No 649293.



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Summary

The general objective of the ProCold project is to empower private stakeholders and public authorities so that they can enforce and implement EU and national energy efficiency policies in the sector of professional cold products.

A specific objective is to ensure more energy efficient professional cold products enter the EU market and increase their market shares, thereby contributing to the EU's energy efficiency goals and policies.

The product groups relate to products cooling, refrigerating or freezing foodstuff and drinks in commercial and professional premises – from public buildings, to hotels, retailers and canteens. They consume a significant amount of energy, important differences exist between various models of the same product category, but, due to lack of clear regulation for some of the product categories and/or lack of information, the potential for more energy efficient models remains untapped.

The legislation concerned is the one regulating the minimum energy performance standards (Ecodesign) and energy labelling, as well as public procurement activities. The ProCold project benefited from a good timing, since a number of the above-mentioned product groups recently had an energy efficiency regulation in place and the project would therefore contribute to the knowledge of direct users, public authorities and policy makers on the specific performance characteristics of these product groups.

The work with manufacturers and retailers for supporting more efficient and sustainable appliances should be positively supported with more evidence. The field measurement described in this document brought elements supporting:

- The quality of the products in real conditions
- The consistency of the data reported on the EU energy label
- The positive activities of the ProCold team in terms of research and promotion of the project's outcomes.

The task started from December 2017, thanks to the cooperation with two of the main stakeholders at national level: one manufacturer (with products listed on Topten/Procold) and a retailer as direct user.

More information on the ProCold project: www.topten.eu/pro-cold

We kindly thank for their cooperation:



ProCold: Field metering campaign

Evaluation of the savings' potential related to the replacement of refrigerated cabinets and freezers

Objective: evaluate and highlight the economic, energy and environmental advantages of the most efficient professional cold products through a brief campaign measuring electricity consumption before and after the replacement of the appliances.

PARTNERS

Sagi Spa, designs, manufactures and markets refrigerated cabinets, refrigerated bases, blast chillers and rapid temperature freezers, pizza counters and refrigerated display cabinets since 1980. Sagi SpA is part of Marmon Food, Beverage & Water Technologies, a US holding company Berkshire Hathaway Inc, and operates worldwide. Sagi offers efficient and sustainable products, available on the Topten list¹, and managed to convince its client for the measurements, before and after the substitution of appliances.

Gruppo Gabrielli, a leading company operating in the Italian retail sector with three brands to which three different distribution formats correspond: OASI for the Superstore, Tigre for the Supermarkets and Tigre Amico for the Superette. Gruppo Gabrielli kindly offered the possibility to install the meters.

Politecnico di Milano, national partner of ProCold, a project funded by the European Union's Horizon 2020 programme, which supports the dissemination of efficient, professional and commercial plug-in refrigerators and freezers, and the increase in use of natural and sustainable refrigerants². The end-use Energy Efficiency Research Group, active in the Energy Department of the Politecnico has wide experience in measurement campaigns and was interested in comparing test/declared data and real consumption data.

¹ Topten product lists, available at www.topten.eu

² Politecnico provided the methodology and tools for the measurement campaign, installed the metering system and has carried out the verification inspection

1 Professional storage freezer

The first task took place at the company canteen of Sagi Spa, operational from Monday to Friday, with an average production of 60 meals for lunch and dinner.



FIGURE 1: LOCATION AND INSTALLATION OF THE NEW MODEL, CANTEEN'S KITCHEN

1.1 Storage freezer - metering phases

- **First phase:** 3 weeks of energy consumption measurement of the existing installed refrigerated cabinet, brand SAGI model **Shine New HD70BT-0P14S³**, 14551246001, with the following features:

- o Storage temperature range: -20/-10°C
- o Net volume: 420 l
- o Climate class: 5
- o Energy efficiency class: F, **3351 kWh/year declared**
- o Refrigerant gas: R404A
- o Internal rack structure AISI 304 stainless steel, suitable to accommodate GN 2/1 trays / grids.



S/N

- **Second phase:** one week of measurement of consumption, following the installation of the new **SAGI model X-Treme XE70B-0P14** freezer cabinet⁴, S/N 80282644201, with the following features:

- o Storage temperatures: -22/-15°C
- o Net volume: 444 l
- o Climatic class 5
- o **Energy efficiency class: C, 1394 kWh/year declared**
- o Refrigerant gas: R290
- o Internal side structure molded in stainless steel AISI 304 suitable to accommodate GN 2/1 trays / grids



³ equivalent to the model Sagi FD70BT, which differs from the tested one only for the construction material and equivalent to the models of the affiliate Angelo Po EX70BT and EF70BT, that differ from Sagi models only for aesthetic details related to the customization of the product.

⁴ equivalent to the Angelo Po XL70B model

1.2 Results and conclusions

Thanks to the data collected it is possible to calculate the average daily consumption of the two products. For the old appliance the average consumption is 8.5 kWh/daily (equal to 3100 kWh/year). For the new single-door freezer cabinet, with sustainable refrigerant and in energy class C, which replaces the previous one in class F, an average daily consumption of 3.4 kWh (1240 kWh/year) was measured, **saving 60% of energy**. For a 450-liter freezer, the replacement means an annual saving of almost 2000 kWh, almost the annual electricity consumption of an average household in Italy (equal to about 2700 kWh/year), or € 4000 savings in 10 years⁵!

⁵ Considering an energy cost of 0,2€/kWh

2 Professional storage refrigerators

The measurement took place at the **Al Battente shopping center, inside the OASI supermarket⁶**, in the kitchen area used to prepare fresh deli dishes ready for retail sale.



FIGURE 2: INSTALLATION PLACE, SUPERMARKET KITCHEN

2.1 Refrigerated cabinets - metering phases

- **First phase:** 3 weeks of measurement of the energy consumption of refrigerated cabinets, produced in the years 2000/2001 and corresponding to the **Sagi** models **65X e 135NNX** (two doors and one common compressor unit) with serial numbers in picture:
 - o Storage temperature: $-2/+8\text{ }^{\circ}\text{C}$
 - o Climatic class 5
 - o Energy efficiency class (estimated) F and D
 - o Refrigerant gas: R134a

⁶ OASI is a shopping center of the Gabrielli SpA group, a food distribution group operating in Italy

- o Internal rack structure in plastic, suitable to accommodate GN 2/1 trays / grids
- o (The declared energy consumption could not be traced back)



FIGURE 3: STORAGE REFRIGERATOR 65X AND 135NNX, WITH S/N

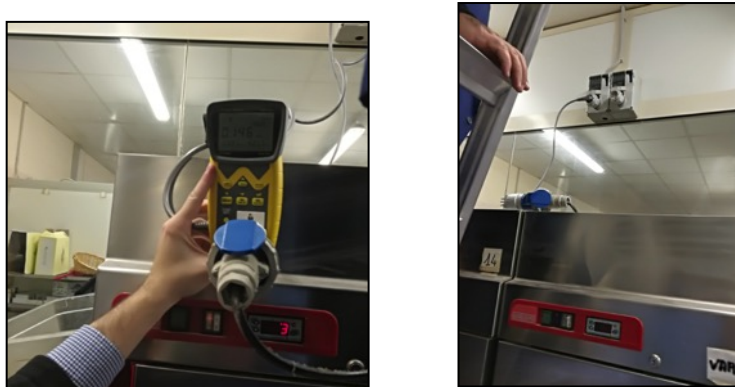


FIGURE 4: METERING APPLIANCES INSTALLED IN OASI SUPERMARKET

- **Second phase:** one week measurement of the energy consumption, following the installation of 3 energy efficient cabinets brand SAGI **model XE70-0P14**⁷, s/n 75282295001 – 75282295002 – 75282295003, with the following features:

- o Storage temperatures: -2/+8°C
- o Net volume: 444 l
- o Climate class 5
- o **Energy efficiency class: A, 321 kWh/year declared**
- o Refrigerant gas: R290
- o Internal side structure molded in stainless steel AISI 304 suitable to accommodate GN 2/1 trays / grids



FIGURE 5: NEW INSTALLED STORAGE REFRIGERATORS INSTALLED IN OASI SUPERMARKET KITCHEN, SAGI MODEL XE70-0P14

2.2 Results and conclusion

For the existing appliances was measured an average consumption of 7.3 kWh / day (equal to 2628 kWh / year). For the 3 new single-door refrigerated cabinets, with sustainable refrigerant and in energy class A, which replaced the previous ones with the same total net volume, was measured an average daily consumption of 1.9 kWh per day (694 kWh / year), **with an energy saving higher than 70%**. The replacement, for each 450-liter refrigerator, offers an annual savings of almost 640 kWh, corresponding to about € 1300 in 10 years, 3900 € for all the refrigerators replaced!

⁷ model equivalent to the product Angelo Po XL70L-0PR0

General conclusions

From the data collected it is possible to determine the high energy saving potential provided by the new efficient equipment: 60% for the storage freezer, about 70% for the refrigerated cabinets.

The measurements, carried out on the installed refrigerated storage cabinets "in real life", show an average daily consumption lower than the one declared on the label (according to the standardized measurement protocol). For the new installed products, a daily average consumption of 0.65 kWh was measured, compared to a figure reported in the EU energy label of 0.88 kWh. This difference is probably caused by the operating temperatures, also detected during the measurements campaign, which are more favorable than those prescribed in the tests (22.3 ° C and 34% of detected r.h., compared to 30 ° C and 55% of r.h. of the climatic class 4 used in the test room). From the data available in literature, it is known that each degree of difference in ambient temperature causes a variation in the consumption of about 2.5%. In the case in question, the difference is 27%, slightly more than 20%, estimated on the basis of the figures reported in the aforementioned studies.

For the measured freezer cabinets, the metered consumption is slightly lower than the figure reported on the EU energy label (-7% for the replaced appliance, -11% for the new one). It was impossible to collect the thermo-hygrometric data in the canteen's kitchen, the installation site of the new freezer cabinet.

The results of the measurement campaign show that:

- The consumption values reported in the EU energy label is in line with the real consumption of the equipment. The estimated consumption reported in the label is a reliable basis for comparison between models.
- In-depth analysis is needed to assess whether climate class 4 correctly represents the average climatic conditions in the environments where the equipment is installed
- Additional measurements could be useful to evaluate the correct relationship between changes in indoor thermo-hygrometric conditions and energy consumption.

Milano, 28th of February 2018, Andrea Roscetti

POLITECNICO MILANO
DIPARTIMENTO DI ENERGIA



end-use Efficiency Research Group

A5 – ProCold Additional testing results



ProCold Appliance Testing

Professional and Commercial Refrigeration Equipment

- Additional Testing –
- Results, January 2018 –

With support from the European Union's Horizon 2020 research and innovation programme the ProCold project (www.topten.eu/pro-cold) assessed the energy consumption of selected professional, commercial and household refrigeration appliances according to different test norms for energy consumption. Four appliances were tested:

- Two beverage coolers (with and without glass door)
- One household refrigerator
- One professional static storage cabinet (freezer)

The tests had several objectives:

- a) Document the direct differences in energy efficiency between otherwise comparable glass door and solid door beverage coolers.
- b) Understand the implications in outcome in applying a previously used test norm (EN ISO 23953-2:2015) for beverage coolers to the most recent one proposed for future Ecodesign regulation (EN 16902:2016). Manufacturers may report energy consumption according to different test norms. Understanding the differences is important to compare declared energy efficiency.
- c) Explore possible differences in achieved energy efficiency of household refrigerators compared to professional / commercial refrigerators.
- d) Gain a principle understanding of professional static cabinet energy performance in relation to forced air cabinets as static cabinets are – as of January 2018 – exempted from all current and proposed Ecodesign regulations.

Test design and tested products for the different objectives

Energy consumption tests as presented in Table 1 were performed among the two independent test laboratories Re/genT in the Netherlands and DTI in Denmark on behalf of ProCold. Default test norms for the given appliances are shaded in grey. No *default* test methods are given in Table 1 for static counter freezers, as these are currently neither covered nor proposed for Ecodesign / Energy Label regulations.

Data measured against different test standards cannot be compared directly and any results must be carefully interpreted. To facilitate comparison and interpretation two similar beverage coolers, with the main difference being solid door vs. glass door were tested against the three test norms EN 16902:2016, EN ISO 23953:2015 and EN 62552:2013 and a similarly sized household refrigerator was tested against test norms EN 16902:2016 and EN 62552:2013.

Table 1: Tested appliances and applied test norms for energy consumption

	EN 16902:2016 Commercial beverage cool- ers	EN ISO 23953:2015 Refrigerated display cabinets	EN 62552:2013 Household re- frigerating ap- pliances	EN 16825:2016 Refrigerated storage cabi- nets
Beverage cooler (solid door) (BC-SD)	X	X	X	
Beverage cooler (glass door) (BC-GD)	X	X	X	
Household re- frigerator (HR)	X		X	
Static counter freezer (SF)		X		X

The beverage coolers and household refrigerator were chosen to be roughly equal in size to allow for meaningful comparison of energy consumption. The main characteristics of the appliances are summarized in the following table:

Table 2: Characteristics of tested appliances

	Volume / Total Display Area	Refrigerant	Solid / glass door	Cooling
Beverage cooler (solid door)	319 litres (EN 16902)	R600a	Solid	Forced-air
Beverage cooler	327 litres	R600a	Glass	Forced-air

(glass door)	(EN 16902)			
Household re- frigerator	288 litres (EN 62552)	R600a	Solid	Static
Static counter freezer	107 litres (EN 16825)	R600a	Solid	Static

Test conditions were foremost determined by the test norms themselves. Tests for beverage coolers according to EN ISO 23953:2015 were done at ambient conditions of 25°C / 60% relative humidity to increase comparability of test results (instead of testing at rated climate class of cabinet). Specific parameters and requirements of the test norms for the refrigeration appliances are provided in Table 3. Several parameters, such as required average temperature, door opening sequence and duration of lighting may have a noteworthy influence on energy consumption and need to be carefully reflected in the interpretation of results.

Table 3: Comparison of test parameters according to EN 16902, EN 62552 and EN ISO 23953 for tests of beverage coolers and household refrigerator

Standard	EN 16902:2016 Commercial beverage coolers	EN 62552:2013 Household refrigerat- ing appliances	EN ISO 23953:2015 Refrigerated display cabinets
Ambient conditions	25°C / 60% rH	25°C	25°C / 60% rH ¹
Tested appliances	BC-SD, BC-GD, HR	BC-SD, BC-GD, HR	BC-SD, BC-GD
Reference tempera- tures	Average temperature: ≤ 3.5°C; Maximum temperature: ≤ 7.0°C; Minimum temperature: ≥ 0.0°C	Average temperature: 5.0°C	Maximum temperature: ≤ 7.0°C; Minimum temperature: ≥ - 1.0°C
Interpolation used to determine the energy consumption	No	Yes	No
Door opening se- quence	No	No	Yes, each door is opened 10 times per hour for a period of 12 hours (door is opened for a total of 15 seconds)
Internal lights on/off (if available)	On, for the first 12 hours	On, for the complete test period	On, during the 12 hour door opening sequence
Test period	24 hours	Minimum of 24 hours with complete operating cycles	24 hours
Product load	330 ml cans	None	Tylose packages
Distance between rear and back wall	100mm	Cabinet is positioned against the back wall ²	Cabinet is positioned against the back wall ²

The test for the static storage freezer is separate from the other tests as in that it was obviously performed at lower freezer temperatures of between -15 and -18 °C. Professional “static” cabinets are cur-

¹ It was agreed between Oeko-Institut and Re/genT to test at 25°C / 60% rH, while according to the standard the cabinet must be tested at the rated climate class. This decision was made because under these circumstances it is easier to compare the resulting data if they were measured at the same climate class. Otherwise, of course, a test at higher ambient temperature typically requires more energy.

² The standard describes to install the cabinet as specified by the manufacturer, or if this is not the case the cabinet shall be positioned against the back wall.

rently not covered in any of the regulations for professional and household refrigeration appliances. Hence, also no specific test norm is “prescribed”. To gain a principle understanding of their performance as compared to similar appliances test norms for professional storage cabinets (EN 16825) and for commercial refrigerated display cabinets (EN ISO 23953) were performed. Table 4 gives an overview of the relevant testing parameters of these two standards, in particular differences in the door opening sequence.

Table 4: Comparison of test conditions for static storage freezer EN 16825 and EN ISO 23953

Standard	EN 16825:2016 Refrigerated storage cabinets	EN ISO 23953:2015 Refrigerated display cabinets
Ambient conditions	30°C	30°C
Reference temperatures	Highest temperature: $\leq -15^{\circ}\text{C}$; lowest temperature: $\leq -18^{\circ}\text{C}$	Highest temperature: $\leq -15^{\circ}\text{C}$; lowest temperature: $\leq -18^{\circ}\text{C}$
Door opening sequence	Initial door opening of 30 seconds, followed by a 4 hour period with door openings six times per hour and an opening time of 7 seconds each. Then the door is kept closed for 4 hours, again followed by a 4 hour period with door openings six times per hour with opening time of 7 seconds each. The remaining 12 hours of the 24 hours period the door is kept closed.	Initial door opening of 180 seconds, followed by a 12 hour period with door openings six times per hour and an opening time of 6 seconds each. The remaining 12 hours of the 24 hours period it is kept closed.

Due to the nature of the cross comparison of appliances for different purposes and a small sample size the results can at best give an indication with regard to the stated objectives. For robust results tests should be repeated with several appliances and ideally multiple test runs.

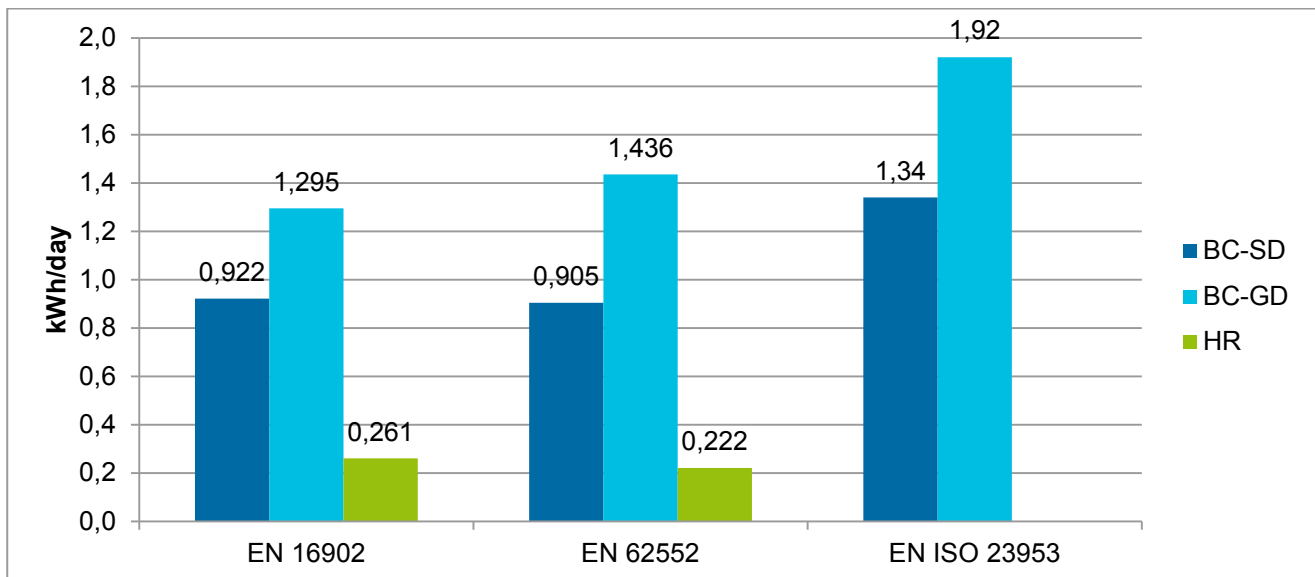
Test results and observations

a) Objective 1: Energy efficiency of glass door vs. solid door beverage cooler

Beverage coolers were tested against EN 16902 (the now default test norm for beverage coolers) as well as EN ISO 23953 and EN 62552. When tested against EN 16902, the version with glass door consumes about 40 % more energy than the version with solid door, 1.295 kWh/day vs. 0.922 kWh/day. Testing against the other standards provides similar relative differences. (Figure 1)

The slightly higher net volume of the glass door beverage cooler (327 litres vs. 319 litres or about 3 % according to EN 16902) does not in itself explain this difference. The lighting of the glass door beverage cooler likely also has an effect on energy consumption, though to a much lesser degree than the overall reduced insulation.

Figure 1: Test results for beverage coolers (BC-SD: commercial beverage cooler with solid door, BC-GD: commercial beverage cooler with glass door, HR: household refrigerator)



For the specific appliance tested, a significant improvement in energy consumption of more than 40% can be registered for solid door cooler versus a glass door equivalent cooler. This is consistent with previous estimates. Wherever not otherwise necessary closed door beverage coolers should be used.

b) Objective 2: Differences in energy consumption of beverage coolers based on different test norms

Tested against EN ISO 23953:2015 both solid and glass door beverage cooler display higher daily energy consumption by about 45 %. Given the difference in test conditions this can mostly be attributed to the 12h door opening sequence employed as compared to the other test norms. According to the test norm, the doors must be opened ten times per hour for a period of 12 hours during the 24h test cycle, while EN 16902 does not have any door opening requirements (cf. Table 3). The thermal energy that enters the beverage cooler during each door opening needs to be compensated by additional cooling effort.

Regular door openings as included in EN ISO 23953 lead to significantly higher energy consumption. It could be argued that regular door openings during an energy consumption test better reflect actual use conditions and thereby “real world” energy consumption. Results according to EN 16902 (without such a door opening sequence) may therefore significantly underestimate later *actual use* energy consumption. Energy consumption results according to EN

16902 may, hence, also provide a lower limit of actual expected energy consumption. In the future this could be confirmed by additional energy consumption test in actual use.

Tests of beverage coolers according to EN ISO 23953:2015 with 12h door opening sequence employed will, hence, not systematically produce lower energy consumption and favour an appliance as compared to EN 16902. If beverage coolers display low energy consumption according to EN ISO 23953:2015 they will likely show even lower energy consumption when tested against EN 16902.

However, EEI calculations cannot be compared directly, as EN 16902 uses net volume as the basis for calculation, while in EN ISO 23953:2015 Total Display Area (TDA) is used. As net volume measurement is not part of EN ISO 23953:2015 an important figure is missing to derive comparable EEI values!

Hence, for the use in Topten-lists EN ISO 23953:2015 may still be used, provided that a door opening sequence was clearly part of the test and EEI calculations are based on net volume measurements according to the newer EN 16902.

c) Objective 3: Performance of household refrigerator in comparison to professional and commercial appliances

Tested against both the beverage cooler test norm EN 16902 as well as the household appliance test norm EN 62552 the household refrigerator displays less than one third of the energy consumption of the tested solid door beverage cooler. (see Figure 1) This could be indicative of a much higher achieved energy efficiency of household refrigeration equipment in general.

Indeed, household refrigerators listed on Topten.eu achieve much lower energy consumption: The top 3 household refrigeration models on Topten.eu with net volume between 300 and 400 litres as of January 2018 have an average reported energy consumption of 74 kWh/year. This compares to 626 kWh/year for the top 3 (albeit glass door) beverage coolers with a net volume between 300 and 400 litres or more than 8 times as much.

The fact that the solid door beverage cooler registers about the same energy consumption (2 % lower at 2 % uncertainty of the measurement) when measured against the household refrigerator test norm indicates that the much lower energy consumption of household refrigerators is not simply due to different test norms.

Consequently, the major differences in energy consumption cannot be explained by the different test standards. Instead, the different performance may primarily stem from the fact that **commercial appliances may have major unexploited efficiency potentials as compared to household refrigeration equipment for which an energy label and ecodesign requirements have been in effect for a while.**

The main argument against this conclusion is the difference in performance requirements for beverage coolers, which must be able to draw down the temperature of loaded cans and for this purpose employ forced-air technology.

However, on the other hand, the presumably lower performance requirements of the household refrigeration test norm EN 62552 do not result in lower energy consumption of the solid door beverage cooler. **This indicates that further significant performance improvements are possible for beverage coolers, e. g. by adapting performance of the compressor to actual performance requirements.**

d) Objective 4: Static cabinet energy performance compared to forced-air cabinets

No direct comparison with a forced-air cabinet was done. The main purpose of the test was, hence, to see if a static storage cabinet can generally be compared to forced-air cabinets by employing the respective test norms and how its energy consumption would compare to reported energy consumption of Topten-listed forced air cabinets.

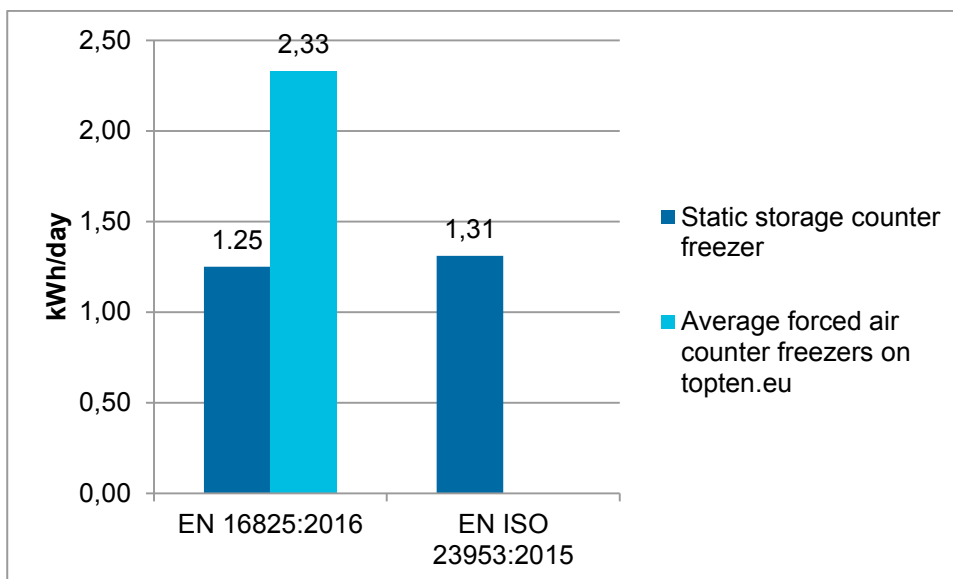
The chosen static storage freezer was tested against both EN 16825:2016, the test norm for professional storage cabinets, and EN ISO 23953:2016, the test norm for refrigerated display cabinets.

Figure 2 shows the measured energy consumption in both cases. Energy consumption measured according to EN 16825:2016 is 1.25 kWh/day, energy consumption according to EN ISO 23953:2015 is 1.31 kWh/day. (cf. Figure 2) The higher energy consumption of the test norm for refrigerated display cabinets can be explained by the more demanding and longer door opening sequence. (cf. Table 4)

To fulfil the required temperature (-15 to -18 °C) the thermostat settings had to be changed to -22 °C **and both drawers had to be in place**. Effective net volume was hence measured at a reduced 107 litres. The required temperature could not be met without the drawers in place.

For purposes of comparison also average energy consumption of forced-air counter freezers listed on Topten.eu as of January 2018 is included. These freezers have an average net volume of 74 litres and an energy consumption of 2.33 kWh/day. The tested static counter freezer, hence, has a 45 % lower absolute energy consumption compared to Topten-listed forced-air cabinets. This is achieved at a higher net volume. **However, the performance cannot directly be compared to forced air cabinets as the door opening sequence was not applied to the two drawers that had to be in place to achieve the required temperature. Ideally, the door opening sequence would allow for opening the main door and the drawers. This would require a very elaborate test set-up that is currently not foreseen in the test norms.**

Figure 2: Test results for static counter freezer



The test of the static storage counter freezer indicates that static cabinets can achieve a high energy efficiency compared to forced-air cabinets, while meeting the required temperature performance requirements. They seem particularly suitable for use-cases for which the

extra opening of the drawers does not constitute a significant burden (e.g. when the freezer is only opened sparingly).

For the future, it is recommended to include static cabinets in ecodesign and energy label regulation to allow for such direct comparison of energy performance. Given the significantly lower energy consumption it is conceivable that static cabinets could also meet performance demands of full door openings while still displaying improved or similar energy consumption characteristics. However, when this is not the case a direct comparison is limited and should be avoided or the use-case (drawers required) clearly marked.

Of course, when installing refrigeration cabinets, settings have to be carefully adjusted to meet all temperature demands (in this case a lower thermostat setting was required).

More information

For more information on the ProCold project, please visit
topten.eu/pro-cold

ProCold is implemented by:

ADEME – Agence De l'Environnement et de la Maîtrise de l'Energie (France), AEA – Austrian Energy Agency (Austria), Bush Energie (Switzerland), Guide Topten (France), Oeko-Institut – Institute for Applied Ecology (Germany), Politecnico Milano – Dipartimento di Energia (Italy), Quercus – National Association for Nature Conservation (Portugal), SEVEn (Czech Republic), and SSNC – Swedish Society for Nature Conservation (Sweden)



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A6 - Policy recommendations final



POLICY RECOMMENDATIONS

ProCold Policy Recommendations for Professional and Commercial Cold products

Maike Hepp, Bush Energie GmbH, Switzerland

14 March 2018

Project Partners



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INTRODUCTION

About the ProCold project

ProCold is a European project in the framework of Horizon 2020, supporting the development and market penetration of energy efficient commercial and professional refrigeration equipment. The project aims at stimulating both the supply and demand side market for environmentally friendly efficient technology by various market oriented services, including among others a web-based product database for efficient products, procurement guidelines and tools and a product competition. The project is implemented in 8 countries (DE, FR, CH, IT, CZ, PT, SE, AT).

The services and tools provided by the project are based on long-term experience with the specific technologies and market in the different countries. The position concerning the draft legislation documents for commercial display refrigeration and regulation review for professional storage refrigeration summarised here therefore is based both on long-term experience in this field and on work from the initial stage of the ProCold project.

The goal of ProCold is to support public authorities in designing and updating current and future European regulations.

OVERVIEW INTERACTIONS WITH PUBLIC AUTHORITIES AND POLICY STAKEHOLDERS

In the member states of the EU 12 times more household refrigerators and freezers exist than professional cold products, but the household sector only uses two times more energy – for household 84 TWh vs. commercial/professional 43 TWh (2015). Regulation for household refrigeration appliances has led to tremendous technical innovations and energy savings while the regulation for professional and commercial refrigerators is still in its early stages.

ProCold has supported not only the development and market penetration of energy efficient commercial and professional refrigeration equipment. ProCold has also continuously supported public authorities and key stakeholders for the development, implementation and improvement of relevant legislation. The main meetings and stakeholders as well as the resulting ProCold policy recommendations are presented in this document.

PROFESSIONAL REFRIGERATED STORAGE CABINETS (LOT 1)

In May 2015, the EU labelling and eco-design regulations for professional refrigerated storage cabinets were adopted and since 1st July 2016 the EU energy label and the first tier of minimum requirements are in effect. On January 2018, the second tier came into effect and models of efficiency class G were banned from the market with the exception of heavy-duty cabinets¹.

In a market survey about product labelling online, ProCold established that in **September 2017, 56 % of products displayed online were still not declared with a label**. For this survey, ProCold accessed the websites of manufacturers of storage refrigerators and freezers and verified if the information pertaining to the devices' energy class was clearly declared. For each manufacturer, the data was collected from one national website that was representative of the European market for that brand. This internet overview included 1914 models by 23 manufacturers and was compared to a similar survey from November 2016 (747 models from 21 brands) where 58 % of

¹ 'Heavy-duty cabinet' means a professional refrigerated storage cabinet capable of continuously maintaining chilled or frozen operating temperature in all its compartment(s) in ambient conditions corresponding to climate class 5 (40 °C, 40 % RH) but where energy consumption is measured at climate class 4 (30 °C, 55 % RH).

products did not show a label from the manufacturer. The very slight reduction of 2% in one year shows that there is still significant need for improvement and increased market surveillance.

Market surveillance (levelling the playing field for all market players) is one of the biggest concerns of manufacturers. The EU Member States (being responsible for market surveillance) will strongly influence the acceptance and efficacy of the new rules, depending on how much resources they can put to check on their national market and to provide to manufacturers a process to deal with doubts about competitors, as well as providing clear outlines about labelling requirements.

During the online survey and subsequent talks with manufacturers and buyers², it was established that in order to help market players to adapt the EU labelling and eco-design regulations, public authorities can provide support especially by:

- Proactive communication about existing and coming EU energy labels and rules to eliminate uncertainties regarding test methods and scope of the regulations
- Tackling some shortcomings of the regulation in the next revision
 - Adaptation of the regulation is needed to eliminate ambiguities in the scope
 - Adaptation to match with B2B (business to business) market conditions

The scope of the regulation is not absolutely clear with regards to the definition of “food processing” and “thawing”³ (especially as many more sophisticated freezers may, through their digital and remote controls, increase the temperature to allow the thawing process as the certain time). Requirements prescribing the product declaration on the internet were formulated without taking fully into account the fundamental differences between B2C and B2B markets. Making the label mandatory near the presence of price-related or energy-related information on advertising materials is not sufficient to guarantee that the energy efficiency class is shown on-line because many manufacturers do not mention this information in the first place. Trade fairs should also be explicitly listed as “point of sale” as high sales volumes are generated especially during trade fairs.⁴

The review process of the Ecodesign Directive for professional refrigerated storage cabinets will start in July 2018. Since the introduction of the Ecodesign and Labelling regulations, several positive impacts have already been achieved:

- The first A+ model is already available on the market (counter refrigerator from Adande Refrigeration)
- Various class A products are available on the market for all refrigeration types (counter, 1-door, 2-doors)
- Class B products are available on the market for counter and 1-door freezers
- The classes A+, A++ and A+++ are defined to welcome future products (i.e. efficiency can continue to be highlighted)
- Declaration of energy consumption is mandatory for refrigerator-freezers and blast cabinets, even if they are exempt from labelling and Ecodesign requirements. As such, it is now possible to consider also energy cost, and not only purchase price, when comparing products

These are the ProCold recommendations for the upcoming review of the regulations for professional refrigerated storage cabinets:

1. **Minimum requirements should be stricter:** min. class D (EEI < 75) should be the first tier implemented because total annual electricity consumption of professional refrigeration keeps increasing despite expected and realized label and Ecodesign savings; BAT products on Topten show that enough products would still be available on the market and exceptions could be planned for special product categories if absolutely necessary.

² The results and conclusions of this market survey were communicated to more than 300 stakeholders in a Topten Focus notification.

³ The Label does not apply if more than 20% of the volume of the refrigerator is dedicated to food processing or if more than one compartment is specifically designed for thawing frozen foodstuffs in a controlled manner.

⁴ http://www.topten.eu/uploads/File/Declaration_Overview_of_Storage_refrigerators.pdf

2. **Remove exemption for heavy-duty cabinets from minimum requirements in the Ecodesign:** "heavy-duty" cabinets are at the moment exempt from the Ecodesign requirements for energy efficiency after the first trial in 2016 (EEI < 115). This might be because in the initial phase they were measured in climate class 5 (40°C, 40% RH). However, energy consumption and EEI for heavy-duty cabinets is currently measured in class 4 (30°C, 50% RH) and the Topten database shows that most of the best available technology (BAT) models on the European market are currently heavy duty. Therefore, exempting heavy-duty cabinets from the minimum requirements is not justified anymore and the regulation should be adapted accordingly.
3. **Refrigerator-freezers should be included in the label** as the declaration of energy consumption has been mandatory since 1. July 2016. A clear instruction for testing of the different compartments is strongly advised to avoid different interpretations.
4. **Static-air storage cabinets should be included in the revision of the Lot 13 household Ecodesign regulation** together with commercial wine coolers and minibars; if there is a risk that this would unintentionally ban specialized types of static-air cabinets for non-household use, they could have different minimum energy efficiency requirements, but should still be covered by product information requirements and energy labelling. Otherwise, static-air storage cabinets should be covered by product information requirements in the regulation for professional refrigeration. Currently there is a gap in product information as it is at the discretion of suppliers and dealers to decide whether a product is intended for household or professional purposes and therefore should or should not be labelled. The ProCold tests showed that static cabinets can achieve a high energy efficiency compared to forced-air cabinets, while meeting the required temperature performance requirements. They seem particularly suitable for use-cases for which the extra opening of the drawers does not constitute a significant burden (e.g. when the freezer is only opened sparingly).
5. **Showcase products using green refrigerants on the EU energy label:** In the original regulation, this chance was missed. The F-gas ban in 2022 is coming and there are still barriers to switch to green refrigerants. Further activities to support the switch are needed to avoid any more sales of products using old, climate-damaging refrigerants. We recommend mandatory display of the refrigerant on the EU energy label to be implemented in the upcoming review. We also suggest the Commission to clearly define "green" refrigerants to prevent harmful artificial substances entering the market.
6. **Mandatory labelling online, in print and at trade fairs without limitation to when price and energy information** is also displayed (as described above).
7. **Ice-machines should be included in the scope** of the regulation for Ecodesign and labelling. The market for ice-machines is bigger than for blast cabinets and saving potentials are substantial. At least a mandatory declaration for energy and water consumption should be added to the Ecodesign documents to provide data that can be used as basis for the introduction of an energy classification in the next review; as no international test standard currently exists, we recommend that CEN /CENELEC are given a mandate to develop a test procedure.
8. **Include mandatory declaration of energy data for remote systems:** remote systems are currently not covered by Ecodesign and labelling. The information currently available on the market does not allow procurers to know if the implementation of a remote system or an assortment of plug-in appliances for their requirements would be the more efficient solution. The regulation should make it possible for buyers to make informed decisions.
9. ProCold strongly encourages **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. Discussions with manufacturers have shown that further support is needed in

interpreting the new EN⁵ testing standards. Ideally questions and answers should be officially communicated by the EC or CEN/CENELEC. Topten will help to spread know-how to manufacturers.

While the introduction of the regulation for professional refrigerated storage cabinets has already lead to great technical improvements, there are still large untapped saving potentials that could be achieved if the above policy recommendations would be included in the upcoming review.

Topten will continue providing technical input to prepare the review study which will start mid 2019.

COMMERCIAL REFRIGERATED DISPLAY CABINETS (LOT 12)

EU labelling and eco-design regulations for this group of products are still in preparation after a stagnant phase between 2015-2017. The latest working documents are the Draft Energy Label and Draft Ecodesign Regulation from DG Energy for Refrigerated Commercial Display Cabinets dates back to 2014. Policy priorities for 2018 indicate that a resumption of the work on this LOT (LOT 12) is planned for the second half of 2018, with adoption and possible coming into effect in 2019.

While many manufacturers have delayed measuring and declaring their products according to official test standards due to uncertainties regarding possible changes that may come during the next consultation forum, the slowly growing numbers of models listed in the Topten database show that data availability improved since 2015. This is due in part to growing awareness on energy efficiency as sales argument and procurement criterion, as a result of the EU regulations in preparation and also due to projects like ProCold and Topten that specifically help the market for high-efficiency products develop. In the absence of relevant regulation, an important motivation for manufacturers to provide standardised product information have been the rebate programmes for energy efficient commercial and professional refrigeration appliances in Switzerland and Austria (set-up by national ProCold teams).

According to ProCold calculations based on JRC estimates, the delay in regulation has led to annual savings lost of 34 TWh by 2024, meaning that the regulation would lead to more purchases of efficient products over the years, accumulating more and more energy savings. 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:

1. **It is very good, that the energy label should reserve the two top classes (B and A) for future innovation** and that best available technology on the market should be at best in class C at the time of adoption.
2. **the energy efficiency index (EEI) formula should be transparent:** it should avoid correction factors and take into account only minimal product segmentation. To preserve a certain comparability of total energy consumption in relation to net volume / display area, it is better to introduce separate minimum requirements and label classes for critical types such as serve-over counters and roll-in cabinets instead of creating a separate EEI calculation. An example is the risk of a bonus for beverage coolers intended for warmer climates: The precedence with household refrigerators shows that practically all refrigerators sold in Europe are marked for climate classes up to tropical, because they get a 20% bonus for it. However, this means that their components are over-dimensioned and not at optimal efficiency.
3. **Commission a new study to provide new M and N values for EEI calculation:** already some beverage coolers reach EEI < 10. If this would delay the implementation of the regulation, the study should take place after the implementation and provide information for the first review (it is more important to have a label to start with than to delay it again).

⁵ EN 16825:2016

4. **The second tier of minimum requirements should trigger significant market development:** within 3-4 years after the formal adoption of the Ecodesign and energy labelling regulations, in the second tier all open freezers should be banned and all open refrigerators should be top-efficient by today's standard.
5. **Total display area (TDA) is not the best parameter to calculate the EEI.** There is a risk that cabinets with glass sides will have an unintended advantage over better insulated cabinets. One possible solution would be to consider only the area of the main glass side (front for vertical cabinets, top for chests) instead of the total display area.
6. **All minibars, wine coolers and static-air display cabinets should be included in the revision of the Lot 13 household Ecodesign regulation;** if there is a risk that this would unintentionally ban specialized types of static-air cabinets for non-household use, they could have different minimum energy efficiency requirements, but should still be covered by the same product information requirements and energy labelling. Otherwise they should be covered by product information requirements in the regulation for commercial refrigeration (including absorption and thermoelectric based systems). Currently there is a gap in product information as it is at the discretion of suppliers and dealers to decide whether a product is intended for household or professional purposes and therefore should or should not be labelled.
7. **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 because with increased segmentation transparency would be lost.
8. **Mandatory labelling online, in print and at trade fairs without limitation to proximity to price and energy information** as described above for professional refrigeration to adapt to the B2B market.
9. **Stipulate consistent instructions on testing of products' series:** a controversial issue for testing and declaration of energy data are the high variety of different configurations possible for each model. If not each model is tested separately, the regulation should stipulate a general rule for worst-case testing or adjustment calculations where possible.

Testing for saving potentials: While it is known that considerable saving potentials can be realized by increasing energy efficiency for non-household refrigeration cabinets, a direct comparison to the efficient (and long regulated) household refrigeration appliances is difficult because the difference in efficiency must be contributed to three main factors:

- the higher energy consumption of commercial and professional refrigerators due to higher technical requirements (ambient temperature, number of door openings, food safety, sound warning systems)
- the different test standards that make comparing results difficult to impossible
- the different efficiency of the products themselves

In order to clarify the second of those factors, ProCold tested 2 beverage coolers (1 glass door, 1 solid door) and one household refrigerator (A+++) by both the EN 16902:2016 for beverage coolers and the EN 62552:2013 for household refrigerating appliances. The results show that no matter which norm was applied, the beverage cooler with a solid door consumed 4 times as much energy as the household refrigerator of a comparable size and the beverage cooler with glass door consumed 5 to 6 times as much energy as the household refrigerator. While a factor of 2 could be explained by the higher technical requirements, this still leaves a factor of 3 – 5 pure efficiency potential. For appliances without door, an additional factor of estimated 6 would have to be added to take into account the "pure" inefficiency of open appliances.

This example conveys the tremendous efficiency potential that is not being realized in the absence of regulation for commercial refrigeration appliances.

Because of the delays in the EU policy process for Lot12 and the new EN standards, uncertainty regarding product declaration remains. Identification of best products, green procurement guidelines etc. will be far easier when the EU energy label and related MEPS is finalised.

CONCLUSION

For professional refrigerated storage cabinets, many class A and even the first A+ class appliances were available on the market not even one year after the coming into effect of the Ecodesign and labelling regulations for Lot 1. With the introduction of an EU energy label for Lot 12, the same rapid development could easily be realized for commercial appliances as well.

Many European manufacturers support the introduction of an energy label for commercial refrigerated display cabinets as it enables them to show the true advantages of their technical innovations on a fair market.

Market surveillance (and fair play of all market players) is one of the biggest concerns of manufacturers. The EU Member States (being responsible for market surveillance) will strongly influence the acceptance and efficacy of the new rules, depending on how much resources they can put to level the playing field on their national market and to provide to manufacturers a process to deal with doubts about competitors. This is valid for both professional and commercial refrigeration appliances.

We are aware that there are some technical issues to be clarified – such as a new study to obtain current M and N values for EEI calculation or defining how to test products' series – but that should not slow down the general process as even a label that is not as effective as it could be under perfect circumstances is still much more efficient than no label at all.

ADDITIONAL FACTS ABOUT PROCOLD

ProCold is a European project designed to support the market development for energy efficient commercial refrigeration equipment. The project is funded in the framework of the Horizon 2020 programme.

www.topten.eu/pro-cold

Project Coordination:

ADEME, French Agency for Environment and Energy Management

Project Partners:

Austria: Austrian Energy Agency, AEA

Czech Republic: 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

Project duration:

01.02.2015 – 31.01.2018

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 - Policy recommendations for commercial and professional refrigeration products
 - Procurement guidelines for storage refrigerators and freezers, minibars and wine coolers and water coolers