Topten: Global Project for the Most Energy Efficient Products

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Abstract

Topten is an international program to create a dynamic benchmark for the most energy efficient products [1-11]. An important step was the expansion to China and USA in 2010. This paper highlights the impact and trends of Topten and its achievements and current challenges:

- Increasing number of product categories: Topten currently presents the best products in a wide range of categories such as cold appliances, washing machines, clothes driers, coffee machines, lamps, office equipment, TVs, and air conditioners. Topten continues to expand the types of products it evaluates.

- Globalization: Topten is, in part, a response to the global appliance market. As well as the suppliers, Topten has to be globally active to have influence on markets and global consumer buying behaviour. This confers a new dimension to the originally European program and permits an exchange of information between the continents.

- Best Available Technology (BAT)-Reference: www.topten.info is a reliable BAT-reference and resource for best available technology values. It sets product efficiency benchmarks, presents the very best products sold in Europe (www.topten.eu), and offers policy recommendations. Thus it is an important tool for policy design processes, such as the EU Eco-Design Directive for Energy-related Products, EU Labelling Directives, Energy Star and national product policies.

- With its short cycle for reviewing and updating benchmarks and the ability to continuously add new products entering the market to Topten listings – in contrast to labels, political instruments and governmental/public bodies – Topten can react immediately to the development of more efficient technologies to provide the up-to-date information that consumers and policymakers demand.

Introduction

Topten is coordinated by TIG, the Topten International Group. Main partners and funders of Topten are the European Commission (SAVE projects), WWF, the European Climate Foundation, the Swiss Government (SECO and REPIC) and many national funders. Topten is a transparent system to continuously identify the "best" products available in each product category (with energy efficiency a key criterion) and to make the results freely accessible via a user-friendly Internet interface (www.topten.info). Topten is a comprehensive platform for energy efficiency: Manufacturers, retailers, large scale buyers and public procurement officials as well as consumers can benefit from the online lists of the most efficient products, the experience and partnerships built by Topten programs, and the information and advice provided to policy makers and end-users.

In Europe, the use of electrical appliances has a major impact as household electricity consumption represents over 30% of total electricity consumption[1]. Therefore the potential to reduce energy consumption and associated carbon emissions through the use of highly energy efficient appliances is significant.

The market for these energy-using products is a complex one, generating three main difficulties:

- For consumers: With an increasing number of energy-using equipment present in our homes

[1] Energy efficient products, Consume Green, 22 project funded by the Intelligent Energy Europe programme, Report n°3, July 2008.

and workplaces, and a wide variety of brands and models available on the market, consumers find it difficult to chose the best performing products and are influenced by many other, often conflicting, messages in their purchasing decisions.
- For manufacturers: The development of energy efficient and innovative products has an initial cost. Manufacturers rely on market demand for these efficient products in order to start their production and to develop genuine marketing strategies.
- For policy makers and regulators: Under the pressure of budget restrictions, it is not always easy to implement ambitious and successful policies, despite the shared concern about climate change and energy issues.

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The purpose of Topten is to provide consumers and energy-management professionals with credible, up-to-date information on the most efficient products available on their local markets. Information on specific product categories is displayed on national websites, in a consumer-oriented way, using pictures, describing functions, availability, listing prices and comparing total costs (purchasing price plus energy and water costs over the life time) with that of a non recommended model – however also available on the market. Because only the best-performing products are listed, the selection is much narrower than typical labeling systems, making it easier for consumers to choose from among the thousands of products available. The selection is based on existing regulations and international energy measurement standards[2], but no complex calculations are involved for visitors of the website: they access best products in one click.

This Topten information covers energy using products of interest for individual consumers and for large buyers (depending on countries): cold appliances (refrigerators and freezers), wet appliances (dishwashers and washing machines), tumble driers, air conditioners, TVs, efficient lighting (CFL and LED), computer monitors, ink jet and laser printers, copiers and multifunction devices, cars, coffee machines, vacuum cleaners, pumps.

Topten is neutral, rigorous and transparent in that there is no influence from manufacturers or retailers and the selection methodology is explained online. Advice for proper use of appliance and equipment is also accessible on-line.

But the Topten concept goes far beyond simply providing web-based information. The websites are actually only the "visible part of the iceberg" and rely on three main pillars:

- Daily technical work on products, in collaboration with manufacturers and importers in order to identify best available products and check all information published and keep it up-to-date,
- Daily media work to attract a large number of visitors to the websites, demonstrating there is an strong interest for high efficiency products,
- Partnership developments with multipliers aiming at specific target groups: retailers, public procurers, local governments, environmental and consumer NGOs, utilities, etc.

Objectives and impacts

The over-all goal of Topten is to stimulate market transformation towards more energy efficient products and to contribute against climate change. Topten pursues three specific objectives, to:

- Increase consumer demand for high efficiency products and awareness on their benefits,
- Increase the availability of high efficiency products across the market and therefore stimulate continual product innovation to drive product performance improvement as rapidly as possible
- Increase the professional demand for high efficiency products and knowledge about their benefits.

Through these objectives, Topten will make a number of direct and indirect contributions to fulfilling CO2 and energy demand reduction targets by reducing the energy consumption of energy using products, which make up 30% of total energy consumption.

[2] European Energy label, EuP implementing measures, Energy Star, European Eco label, Blue Angel…

Within the market transformation toolbox, Topten is considered as a "soft measure" which focuses on the cutting edge of the market, pulling the whole market toward more energy efficiency. It has several impacts on the market (Bush et al., 2009) by supporting:

- Consumers with targeted information
- Manufacturers in the promotion of their most energy efficient products
- Retailers in increasing their mark-up and reinforcing their image
- Large-scale buyers and public procurement officers in choosing efficient products
- Policy makers with the identification of best available technologies
- The media, acting as a trustable and independent source of information
- NGOs, institutions and utilities, using Topten in their daily work

Topten has in several product categories (e.g. laundry driers, coffee machines etc.) proven to be able to move market transformation towards more efficient products swiftly. Its independence from direct industry influence has given credibility to influencing government standards and labels.

Key results of Topten Europe

The European market continues to be surprisingly fragmented among individual national markets or at least regional markets (e.g. regional markets like Scandinavian countries, southern European countries etc.). Even though only a few major industrial companies produce appliances and distribute them across Europe, they do not deliver high efficiency products evenly. For example, a Topten.info[3] research covering 23 countries shows that in May 2009 there were 286 A++ cold appliances across the entire European market. However, out of these 110 different models were available in Germany compared to only 1 in countries such as Spain, Greece or Norway.

Even though the context is very internationalized, national markets continue to be influenced greatly by different patterns of use (for instance laundry washing/drying in Scandinavia versus southern Europe), different tax regimes and energy costs, and also the different languages. The differences in GDP, in consumption and energy intensity between new and old Member States and also within new Member States can also be remarkable, e.g. in Romania where the primary energy intensity is 3,9 times higher than the EU 27 average[4] and where the Electricity consumption per dwelling is about 1750 kWh in the urban area and about 850 kWh[5] in the rural area.

In concrete terms, this means that most products in Europe:

- Differ technically between member countries or regional country groups, and that only few products are uniform across Europe (cars, Office Equipment, some Consumer Electronics for instance),
- Bear different brand names even where they are technically identical,
- Have different prices (due to different marketing strategies, different rates of value-added tax and due to special features of national and regional markets) and also
- Have significantly different life-cycle costs due to different energy and water prices.

The outcome of this situation is that manufacturers are unable to make use of potentially cost-saving economies of scale, and retailers and large consumers face extra cost and increased information-gathering effort. For private consumers, this situation means that an orientation to nationally available products continues to prevail and European-level harmonization is difficult to achieve. Consumers also lose out in terms of access to the best performing products, as these are not distributed evenly across the EU market.

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[3] Source: Topten.eu, cold appliances, market situation.

[4] In 2007, using Euro2000, source: Eurostat

[5] In 2007, source: Romanian Institute of Statistics data processing

Given this situation, Topten offers a number of strengths in its approach by working both:

- Close to the consumer, at national level, providing information on the products actually available on national markets as a Portuguese consumer does not care for high efficiency products available in Poland and match the preferences of Polish consumers.
- Close to the manufacturers, at international level, where strategic decisions are taken: 18 European countries are working in parallel with their own Topten website (within the "Euro-Topten-Max" SAVE project) reaching a critical mass and being heard as a single voice spreading the message in favour of energy efficiency.

Providing clear information to different target groups and having a dialogue with manufacturers' headquarters is particularly important at a time when new regulations are being enforced (ErP implementing measures, new labels and new product labelled). Topten actually contributes to the Eco-Design and labelling processes and therefore to the EU 2020 targets: Topten offers the opportunity to provide a realistic overview of the availability on the EU internal market if energy efficient products, to stimulate the diffusion of the most innovative products and to support decision makers to launch new initiatives promoting products efficiency and energy conservation. The Topten information, be it at national or European level, is often used by the European Commission as a reference and benchmark for future policy design, labelling strategies, dissemination programmes, as a basis for the adoption of minimal efficiency requirements and specifications for large-scale buyers.

Key figures of Topten Europe:

- 188 product categories were displayed on-line
- Broken down into 409 subcategories (presenting the most appropriate market segmentation from the consumer point of view)
- More than 11 100 products were listed. This represents only the small share of the most energy efficient products available in the corresponding countries, products which were identified and for which the Topten teams have led a paper check in collaboration with manufacturers
- More than 1 million visitors between January and May 2010 (generating 13 million hits)
- From January 2009 to June 2010: More than 28 000 articles in the printed media generating 95 Million readers, more than 2 000 Internet articles generating more than 20 million hits, more than 100 television reports with 74 million viewers and more than 200 radio reports with 31million listeners
- More than 40 partnerships with organisations relaying the Topten message in their daily activities (e.g. cities, utilities, NGOs, retailers).

At the international level, Topten China and Topten USA were launched in October 2010. Beyond the usefulness for local consumers and global climate action, this is a crucial development for Europe because it will allow a better understanding of energy using products that are massively imported to the European continent.

Key results of Topten China

China is in a rapid phase of economic development not only in urban areas. Millions of households have now access to refrigerators, room air conditioners, TVs and motor vehicles, etc. The rural market is also keeping expanding due to incentive policies such as “Home Appliances Going to the Countryside”, etc. Energy consumption and greenhouse gas emissions due to the use of consumer goods are growing rapidly. Because coal plays the fundamental role in China’s electricity generation, improved energy efficiency for consumer goods in China is a key element in Chinese energy policy in order to slow up the need for additional electric generating capacity and greenhouse gas emissions.

Topten China provides the internet platform www.top10.cn to show the most energy efficient products among household appliances, consumer electronics, office equipment, building components (including solar), and motor vehicles. The Topten products use on average only 60% of the energy of a similar standard product sold, in many cases they use only 30% of the existing old product being replaced. The Topten information platform serves to stimulate consumers to buy energy efficient products and to help retail chains and manufacturers to bring more efficient products onto the market.

On 26 October 2010, www.top10.cn was publicly launched in Chinese (simplified Mandarin) and English with 7 product categories listing 259 products: refrigerators, washing machines, electrical water heaters, air conditioners (fixed speed and inverter), monitors, copiers and passenger cars. The expansion in 2011 will include several additional key product categories (e.g. TVs, lamps, microwave ovens).

Figure: Screen shot entry page of Topten China

Chinese page	English page
	

Figure: Chinese and English product pages: air conditioners

The Topten products are selected based on market research in key retail stores in China and from public available government databases. Their selection into the Topten list also depends on the accuracy of the energy performance data. Mostly manufacturers' self-declared data according to the standards and energy labeling and certification scheme are currently available. Check testing has proven that these data are not always sufficient and sometimes grossly inaccurate to select the very best products according to Chinese testing standards and the China Energy label criteria.

Conformity test program

The declarations given on energy labels (e.g. in China, USA, Europe) usually are provided by the manufacturers. In order to secure the energy performance data of the selected products, a first round of conformity tests with the following products was made by China Household Electric Appliances Research Institute:

- Refrigerator/freezers
- Air conditioners
- Monitors

CHEARI CTP	Total products	Passed products	Failed products	Passed (%)
Air conditioner	9	8	1	89
Refrigerator	10	9	1	90
Monitor	10	10	0	100
Total	29	27	2	93

The conformity test of 29 products showed that two did not comply and various smaller deviations of self-declared values were revealed. Most of the products (93%) meet the requirements set by Chinese standards and regulations. The measured energy performance of the air conditioners and refrigerators usually are lower than the declared performance from the manufacturers. The measured energy performance of monitors is higher than the declared performance from the manufacturers.

Media work and public launch

The public launch was a coordinated international event with Topten China, and Topten USA to demonstrate the global reach of the energy efficiency platform. It was the successful test of the build-up of a media network with several key media partners: Currently we are in contact with 14 media in China. Among them, the most important ones are:

- Sina (one of the biggest portal websites in China)
- Autohome (one of the most popular car websites)
- PCPOP (one of the most popular IT products websites)
- China television CCTV（a WWF media partner, to be pursued further)

The media echo of the launch in China was very big: The following print and electronic media brought a report on Topten China: Beijing times, Fazhi news, China environment news, Sina Green, Sina news, PCPOP, IT168, CHE168, Autohome, Tianjin news, China5e, 163, qq, YNET, Sohu, WWF websites around the globe, VECC website.

Government relations and partners

Government activities in this field are highly relevant in China. They include:

1. Testing standards
2. Mandatory energy minimum performance standards (MEPS)
3. Financial incentive programs
4. Procurement lists

Chinese government agencies (SAC, AQSIQ, CNIS, VECC, ERI, et cetera) are interested and open to international exchange on several energy efficiency matters which Topten could support: standards, labels, procurement, financial incentives, testing.

Lessons learned

The experience of building up a test site (by end of 2009) and making a public launch of 7 key product categories with 259 products in October 2010 has provided some key insights into the Chinese decision making and market transformation potential of consumer goods:

1. Basically the innovative approach of Topten was – after a time of hesitance – accepted and appreciated. The hesitance was due to the competition of BAT products (maybe 5% – 10% of the market) with the energy labeled products in the best China "Class 1" which often include between 30% and 80% of all available products.
2. The fear was also that Topten would often select only high performance foreign brands (Electrolux, Siemens, Bosch, Toshiba, Panasonic, Osram, Philips, et al), neglect Chinese brands and thus cater for a high priced premium product and consumer segment only. However, the test site already showed by the end of 2009 and now the published site proves that this is not the case and that there are many Chinese brands at acceptable prices that can compete easily with imported foreign brands. Only 42% of the 259 products have foreign manufacturers from Japan, Korea, Europe, and USA
3. An Advisory Group (AG) was created as part of an effort to form a Topten China Framework agreement that includes a number of key organizations in China contributing to the significance of the approach. The AG has a Charter with an informal status. Initially, some high officials contacted saw a potential conflict of interest in their government role and supporting an NGO selection of BAT products, while they appreciated Topten's efforts contributing to the Chinese government's national policy "Save the energy and reduce the emission". The AG makes Topten China working close to the high priority fields of energy and climate.
4. The first pilot set of conformity testing has shown that it needs to be repeated systematically for most of the product categories to secure the accuracy of the energy efficiency data.
5. Market research of energy efficient consumer goods in China confirms experiences of other regions:

    - The testing standards are sometimes outdated and not internationally harmonized, not able to distinguish performance with new advance technology (e.g. quality of compact fluorescent lamps).
    - The government minimum energy performance standards MEPS are decided on late and too low, and sometimes they are not fully enforced.
    - Some financial incentives have been implemented (ACs, motors) and mostly oriented towards increasing sales volume, not top class energy efficiency.
    - Procurement lists are too long and include cheap low quality products as well as energy efficient products.

6. We have learned that the key element in the process of market transformation is to make the access for better products faster and easier. China has already a set of energy efficient products but they are not easy to find and not available in all retail stores.

Key results of TopTen USA

TopTen USA, was formed as a U.S. nonprofit organization in early 2009 by a group of U.S. environmental organizations, national and regional energy efficiency groups and utilities (see Bush et al., 2009 for a brief history and Dean, Bauer & Coakley 2010 for an update). The organization's startup was funded by charitable contributions and significant in-kind donations of time by the staffs of the founding groups. TopTen hired its Executive Director in August 2009 and, working through a team of expert consultants, developed its initial product lists and built a state-of-the-art web site. See www.toptenusa.org. The web site was beta tested through the summer of 2010 and opened to the public on November 9, 2010.

TopTen USA launched with lists of 10 product categories, some of which have been subcategorized. Table I lists the product lists currently found on the TopTen USA web site, those expected to be completed within the next two months, and the schedule for product category revisions.

Product Category	Subcategories	Revision Schedule
Refrigerators	Extra-large Large Medium	Annually
Freezers	none	Annually
Televisions	Large Medium Small	Every four months
Laptop Computers	none	Every four months
Desktop Computers	Expandable Non-expandable (under development)	Every four months
Cars	none	Annually
Light Trucks & SUVs	none	Annually
Dishwashers	none	Annually
Clothes Washers	Large Small	Annually
Computer Monitors	Large Small	Annually
Room Air Conditioners (completed, to be available when retailers begin to sell machines)		Annually
Water Heaters (to be completed in June 2011)	Condensing Gas Storage Condensing Gas Tankless Heat Pump Storage (tentative subcategories)	Annually

In general, as noted in the Table, TopTen USA will revise electronic products every four months and white goods and vehicles annually. However, it will add products to its top ten lists between specification revisions if new products enter the market that are more efficient than the currently listed products.

Once a product is on the TopTen list, it will remain on the web site for a period of at least six months after it has been "bumped" from the top 10 list by a more efficient product. In such cases, the older listed products will be moved onto a separate list for a period of six months (or until they are no longer sold, whichever comes first) and will be "vintaged." Vintaged products will bear the date on which they were first listed and can continue to be marketed as "TopTen listed" products.

The potential energy and cost savings from the TopTen USA program are substantial as shown in the estimates in the Table.

PRODUCTS	Energy Use of Typical Old Appliance (kWh/year)	Cost to Run Typical Old Appliance ($/year)*	Energy Use of an Energy Star-Qualified Appliance (kWh/year)	Cost to Run Energy Star-Qualified Appliance($/year)*	Energy Use of Leading Same-Sized TopTen Appliance (kWh/year)	Cost to Run Leading Same-Sized TopTen Appliance ($/year)*	CO2 Savings Over Life of Product if All Products Were TopTen instead of Old (Metric Tons)	Electricity Cost Savings Over Product Life if all Products Were TopTen instead of Old ($/lifetime)
Large LCD Televisions	455	$54.60	243	$29.16	81	$9.72	88,825,361	$ 15,259,200,000
Computers	231	$27.72	55	$6.60	22	$2.62	61,375,838	$ 10,543,680,000
Clothes Washers	790	$94.80	381	$45.72	118	$14.16	45,136,659	$ 7,753,971,456
Refrigerators	1,065	$127.80	590	$70.80	356	$42.72	59,812,672	$ 10,275,145,632
Freezers	674	$80.88	704	$84.48	460	$55.20	3,451,414	$ 592,914,221
Dishwashers	451	$54.12	324	$38.88	180	$21.60	14,771,299	$ 2,537,543,405
TOTALS	3,666	$439.92	2,297	$275.64	1,217	$146.02	273,373,243	$ 46,962,454,714

Table: TopTen USA CO2 and money saving estimates thanks to the use of TopTen appliances

Even when compared with ENERGY STAR qualified products, energy savings of at least 40% are possible by deploying TopTen-listed products, and many categories would deliver larger savings (over 65% for the large TVs and freezers). The cumulative carbon dioxide emissions reductions estimated for the electrical products listed in the table are equivalent to over one-fifth of total US energy-related carbon-dioxide equivalent emissions from the residential sector in 2009 (1.16 billion metric tons CO_2e)[6].

To promote its lists TopTen USA , includes the following features in its program, in addition to energy use and savings:

- Detailed product specifications
- Ties to social networking sites such as Facebook and Twitter.
- Use of blogs and traditional media to publicize the program.
- Current price and availability data for listed products.
- Up-to-date information on any financial rebates available for listed products and direct links to instructions on how to claim the rebates.

The TopTen USA website also contains educational material for consumers on how to buy, use and properly dispose of or recycle products.

In order to reach large numbers of consumers, TopTen USA is focusing on four strategies.

First, TopTen is building "partnerships" with non-governmental organizations having large memberships. Those organizations are linking to our web site and encouraging their members to visit our site and buy listed products. As of mid-December 2010, TopTen USA had partnerships with organizations having over 3.5 million members. A large U.S. NGO, Environment America and its 26 state affiliates have partnered with TopTen USA to promote high efficiency products. Each of those groups has it own home page. For an example see http://www.toptenusa.org/environmentcalifornia.

Second, TopTen is developing pilot projects with utilities and retailers to reward those that sell TopTen USA listed products. This program is in its infancy and began with the development of a compelling "business" case for utilities to use TopTen to promote more efficient products.

Third, TopTen is working to increase its ranking on search engines. The organization's approach includes

- Encouraging companies, bloggers, news media and others to link to our site,
- Employing the various tools such as keyword placement that helps with search engine optimization.
- Employing Google Analytics, Alexa and other tools to monitor closely how visitors are using our site and what such data tells us about how to improve the site and site traffic.

Fourth, TopTen USA has begun to run advertisements on Google as the result of a grant from Google. These ads provide consumers who, for example, are searching for high efficiency refrigerators to get a direct link to TopTen's list of the most efficient refrigerators.

To enable consumers to see top ten lists while in stores, TopTen has a smartphone version of its web site that makes its lists easily read on iPhones, Androids, Blackberry and most other phones with web access. When a consumer attempts to access TopTen USA from a smartphone, the smartphone version is automatically fed to the device.

What does TopTen USA plan in 2011? Among other things, the organization will add an additional three new product categories, improve the functionality of the website-- including adding several new features, and create the ability to feed content out to utility partners and other websites through either a widget or API. It will be expanding its partnerships with utilities, retailers and NGOs

[6] Source: http://www.eia.doe.gov/forecasts/aeo/index.cfm

Conclusions

The expansion of the Topten family beyond Europe is adding value to our collective efforts to stimulate market transformation towards more energy efficient products and thereby mitigate climate change. Benefits of this geographical expansion include:

- Creation of an avid network of Topten management, product and communications experts – as well as partner institutions – around the world who "speak the same language", which presents greater opportunities to share best practices, technical data, insights, and contact networks.

- Improved understanding of the status and dynamics of global consumer product markets and related product policy developments.

- Greater clout with manufacturers, energy efficiency program administrators and large buyers, due to growing coverage of consumer product markets globally.

- A growing body of experience and lessons learned in a wide range of national contexts to effectively assist additional markets with launching Topten systems expeditiously. We now have a good understanding of Topten success factors; typical budgets and work plans; product data and human resource pre-requisites; effective institutional arrangements; approaches to establish and update project lists, perform quality assurance and assess program impacts.

- Stronger arguments to potential funders and implementation partners, which may seek to invest in impactful and cost-effective programs around the globe. In addition to the above reasons, this includes the potential to pool human and financial resources among TIG members.

A common challenge for Topten systems in many countries is defending the legitimacy and suitability of Topten as a service provider to be the resource of choice to help market actors identify the most efficient consumer products. Governments are sometimes concerned about interfacing with non-governmental actors and may even consider playing this market function themselves. This past fall, the US Environmental Protection Agency and Department of Energy conducted a public consultation on a proposal to create an ENERGY STAR "Top Tier" program, which shares some features common to TopTen USA, but which met with mixed reviews[7]. Whereas there was broad recognition of the need to assist consumers in identifying the most efficient products, some expressed concerns about diluting the ENERGY STAR brand and confusing consumers, as well as whether ENERGY STAR has the resources for a successful and nimble Top Tier initiative (without diverting funds from the core ENERGY STAR program). A number of respondents specifically recommended coordination with existing programs in this general space, including TopTen USA. In Europe, where some Topten systems have been in place for over a decade, the dynamic Topten benchmarking system has proven to be a valuable complement to standard and label schemes.

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- The European Climate Foundation (www.europeanclimate.org) who supports Topten in updating and expanding technical and policy analysis of the most energy-efficient products.

[7] http://www.energystar.gov/index.cfm?c=partners.top_tier_proposal

- WWF (www.wwf.org) who supports the build-up of Topten China (www.top10.cn) and supports other Topten projects in Hongkong, the USA (www.toptenusa.org) and Europe.

- The Swiss government: REPIC (Renewable Energy & Energy Efficiency Promotion in International Co-operation - www.repic.ch) and SECO (State Secretariat for Economic Affairs - www.seco.admin.ch) who supports the build-up of Topten China

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