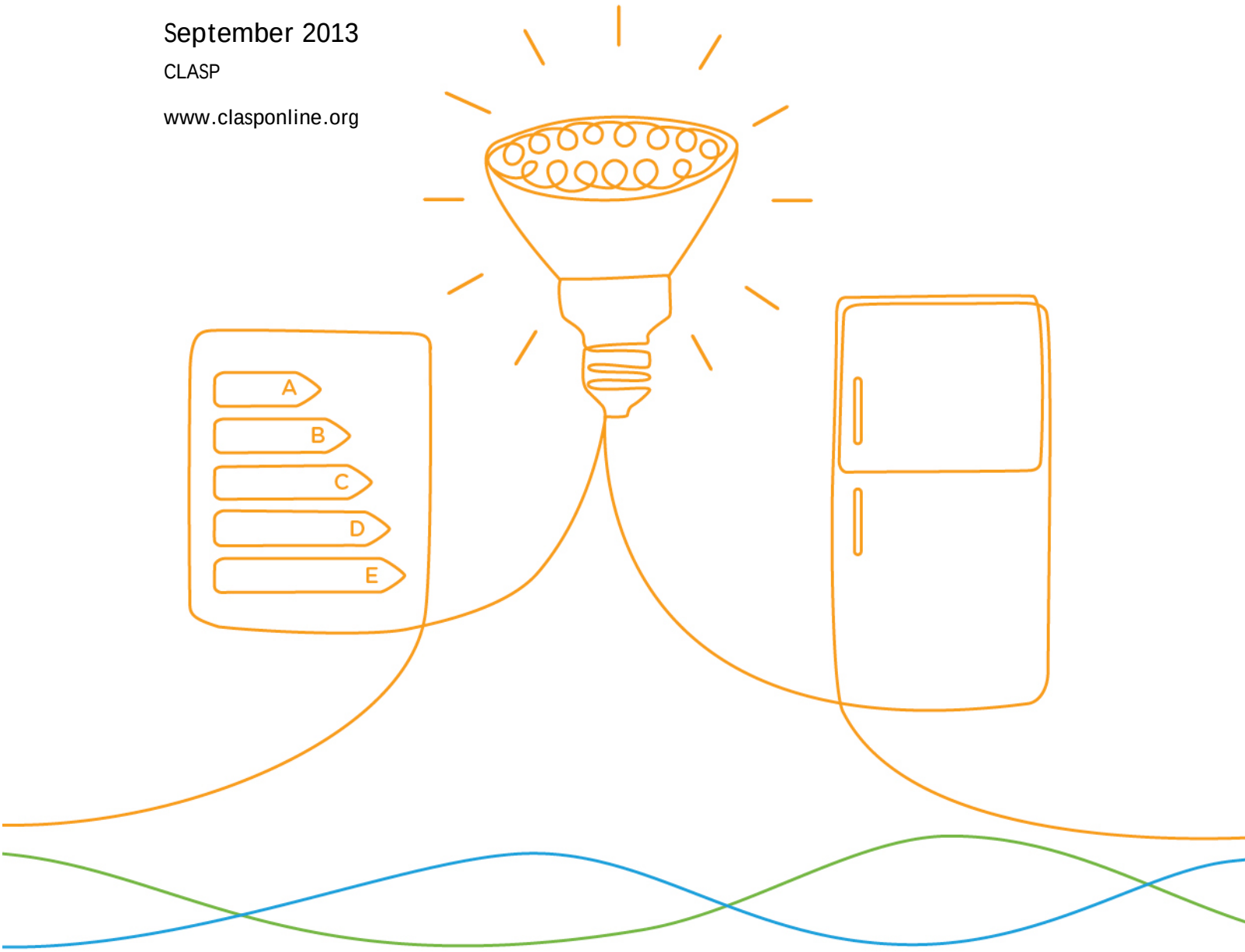
Market Analysis of China Energy Efficient Products (MACEEP)

Executive Summary

Jayond Li, Steven Zeng, CLASP
Hu Bo, Zheng Tan, Top10 China

September 2013
CLASP
www.clasponline.org



In recent years, the market for domestic appliances in China has flourished due to the continual increase in personal income, speed of urbanization, and the population's desire to improve their quality of life. However, without policy intervention to reduce the amount of energy consumed by these products, their projected electricity consumption will rise from 591 TWh per year in 2012 to 748 TWh per year in 2020, and to 821 TWh per year in 2030 (a 39% increase electricity consumption over the period).

In 2012, CLASP identified an opportunity to collect and analyze market data that would help Chinese policy makers set achievable and more stringent targets for upcoming revisions of minimum energy performance standards (MEPS) for various energy-consuming appliances. With support from the US Energy Foundation, CLASP partnered with Top10 China and several international experts to conduct the *Market Analysis of China Energy Efficient Products* (MACEEP) and a parallel study on potential energy savings[1] that could result from more stringent policy measures and improved product efficiency.

The goal of this research is to improve policy maker knowledge by providing a comprehensive and transparent picture of the Chinese market for domestic appliances. This includes the number of appliances currently available on the market, the energy efficiency and consumption distributions of these appliances, and the market and policy influences that affect their regulation. Ultimately, the study provides recommendations for policy interventions that could lead to improved efficiency or reductions in the energy consumption of Chinese appliances in the future, with associated estimates of potential energy savings.

The MACEEP study covers nine specific products: fixed and variable speed air conditioners, induction cookers, copy machines, monitors, refrigerators, rice cookers, televisions, and washing machines. Data was drawn from surveys of products available on the market in July 2012, supplemented by information from public sources such as the China Energy Label website and the China National Bureau of Statistics. Notably, MACEEP is the first study of its kind to be conducted based on independently-collected, third party market data. Overall, the data in the individual product analyses derives from over 6,000 individual appliance models. The study provides over 90 recommendations to Chinese policymakers within the individual appliance analyses. In each case, these recommendations are specific to the appliance. However, we have compiled the following overarching recommendations that are likely to be of particular interest to policymakers. These are as follows.

[1] Energy Saving Potential (ESP) Study for Nine Appliances in China, CLASP 2013.

Immediate energy saving opportunities

Significant energy saving opportunities are immediately available through relatively simple revisions to the minimum energy performance requirements for induction cookers, monitors, refrigerators, rice cookers, TV, copier, and fixed speed air conditioner. If policymakers choose to adopt all of the recommendations for these products immediately, the revisions would result in cumulative energy savings of at least 269 TWh by 2030.

Policymakers should be reassured that there is little evidence to suggest that such revisions would have an adverse impact on product price. In some cases, it may be necessary to support some manufacturers in adapting to higher performance requirements if a change in production is necessary – such as switching from compact fluorescent (CCFL) to light-emitting diode (LED) television technology.

Revise current strategy for developing energy efficiency Tiers

The current strategy being pursued by Chinese policymakers when developing energy efficiency standards has resulted in a large proportion of products qualifying for the higher efficiency levels, or "Tiers," with little apparent difference in efficiency. This means that consumers do not have the opportunity to preferentially select the most efficient products at the point of purchase. Moreover, there is limited incentive for manufacturers to develop higher efficiency products, since they will not be distinguished in the market.
Policymakers face challenges in revising the energy efficiency Tiers, as there is relatively little spread in efficiencies between products. Consequently, the lack of additional efficiency requirements makes it difficult to effectively implement additional policy support measures (such as subsidies) or to promote the most efficient products.

Therefore, policymakers may wish to consider a strategy whereby future revisions to the energy efficiency Tiers for all appliances will introduce new performance requirements such that:

- Tier 1 requirements are set at the efficiency level of the best performing appliance in the market at that time, thus creating the equivalent of a "Top Runner" target – i.e., the top 5% of products in terms of energy efficiency – to encourage the development of new high performance products, and as desired by policymakers under separate initiatives;
- The Tier 2 requirements dictate that only the top 10% of efficient appliances are eligible for qualification at the time the standard is introduced; and,

- The remaining products are evenly distributed across the remaining labeling categories.

Furthermore, an automatic revision of the Tier requirements should be initiated when 10% of products in the market achieve Tier 1 performance, or 25% of products achieve Tier 2 performance. This would ensure that higher efficiency products are continually differentiated from other appliances on the market.

Such a strategy would allow consumers to choose higher-efficiency products and allow policymakers to more effectively pursue other policy support measures that target the best performing products. This strategy is also in line with current (or likely) developments in other countries such as Australia, Canada, Korea, and Japan – where premium products are effectively identified in the market, or automatic standards revisions are undertaken when approximately 25% of products reach a level considered to define premium efficiency.

Reorient the focus of future subsidy programs

There is little doubt that the use of subsidies in support of efficient appliances has achieved the primary goal of stimulating national demand for the appliances and increasing their penetration into rural areas. However, there is some evidence to suggest that these subsidies have been less effective in promoting the development and adoption of higher efficiency products due to the large number of products that are typically eligible to receive subsidy support. In some cases, the subsidies have been supporting products that are highly efficient, yet still consume very high levels of energy. For example, LED-backlit televisions with very large screens may be highly efficient, but will still consume over twice as much power as a television of half the screen size.

Therefore, if policymakers want to continue the use of subsidies to promote energy efficient products, they may wish to consider:

- Only providing subsidy support for Tier 1 or higher products; or, if the current standard-setting strategy is revised in line with the study recommendations, including Tier 2 products if Tier 1 products are restricted to “Top Runner” status; and

- Setting a maximum cap on total energy that can be consumed by the appliance. This introduces the concept of sufficiency in addition to efficiency – i.e. not subsidizing expensive products of large size or volume, and/or those containing sophisticated but energy-consuming functions.

Make efficiency requirements technology-neutral

Currently, a number of appliances with the same functionality qualify for differing energy efficiency Tiers and minimum performance requirements based on different technologies. For example, plasma display panel (PDP) and liquid crystal display (LCD) televisions, ceramic and non-ceramic rice cookers, and impeller and drum washing machines all have differing energy performance requirements – and in some cases, different test procedures. This is very likely to mislead consumers in the relative performance of the various appliance types and is likely to lead to inadvertent purchases of products that consume significantly more energy than necessary.

Therefore, the study strongly recommends that policymakers attempt to ensure that all appliance standards are based on technology-neutral test methods and performance requirements. It should be noted that some manufacturers may require additional policy support to shift production where their existing product range is adversely affected by the switch to a technology-neutral standard.

Research consumer usage patterns

How consumers use a product in real life in their homes directly impacts several factors used in the development of energy efficiency standards. It affects projections of energy consumption and saving potentials, the accuracy and relevance of test methods, and determines the actual energy used by the consumer in their household. Despite this, very little public information appears to be available on current consumer usage patterns for the majority of appliances in China. The study therefore recommends initiating a research program to establish how individual appliances are typically used by households and with what frequency.

Revise labels to include actual energy consumption data

Currently, a number of the criteria displayed on energy labels are not assisting consumers in selecting the most efficient or lowest energy-consuming appliance. For example, the declared energy efficiency index (EEI) of televisions and the thermal efficiency of rice and induction cookers have little meaning to consumers and are unlikely to impact their purchasing decisions.

Using efficiency as a measure of comparative performance is not always beneficial. For example, a Tier 1 five-liter rice cooker will almost certainly use more energy than a Tier 4 four-liter rice cooker, but that information is not communicated effectively on the label. A consumer aiming to purchase efficient products may purchase the five-liter unit due to its apparent high efficiency, but ultimately that unit will consume more energy.

Therefore, the study recommends that a typical daily, monthly, or (ideally) annual energy consumption figure be included on the label for most products, similar to that which is used for refrigerators and copiers. This is already a nominal requirement of the energy labeling management rules.2 In the longer term, the calculation of the energy consumption should be based on typical usage patterns established by consumer research.

Require energy labels to reflect typical product performance, and review allowable testing and labeling tolerances

There is evidence to suggest that some manufacturers are reporting energy performance values on appliance energy labels that are higher or lower than the typical performance of the model. This has the potential to lead consumers to select an appliance that is not appropriate for their needs or that fails to meet their expectations of energy consumption. It can also lead to the development of inappropriate revisions to the affiliated energy efficiency standard or hamper the development of a more appropriate one.

Therefore, the study strongly recommends that policymakers require declarations of energy efficiency and other performance indicators on an energy label in order to accurately reflect the true performance values reported in the test certificate submitted with the label application. This test certificate must represent the typical performance of the model under production conditions. Furthermore, once clarity is achieved in product claims, policymakers may wish to re-examine the tolerances, or allowable level of variance between test results, in test methods and labeling claims to ensure they are appropriate for each appliance type.

Revise some test methodologies and thresholds for performance

A number of potential shortcomings have been identified in the existing test methodologies for TVs, rice cookers, and induction cookers, such as the brightness setting in the television test methodology. Policymakers may wish to encourage revision of these test procedures – possibly through the adoption of existing and accepted international methodologies – to ensure that the performance of the appliance is represented accurately. This information is essential for consumer decision-making and for the development of appropriate policy measures.

---

[2] Clause 8 of the "energy label management rules" states "the label should include information of energy consumption." http://energylabel.gov.cn/NewsDetail.aspx?Title=%e6%94%bf%e7%ad%96%e6%b3%95%e8%a7%84&CID=31&ID=137

Similarly, an issue has been identified in the use of a linear functions and adjusted volumes as the basis for regulation of refrigerated appliances. The current Energy Efficiency Standard is based on a linear function and adjusted appliance volume to derive the energy efficiency performance Tiers and the associated minimum energy performance levels. However, the use of such a linear function *and* adjusted volumes has the effect of increasing the price of smaller units and/or improving the apparent efficiency of larger appliances. Either (or worse both) of these outcomes is giving an incentive for consumers to purchase larger appliances which leads to higher overall energy consumption. The approach used in China is in line with current practice in the majority of countries around the world. However, Chinese policy makers may wish to consider a move to curved exponential functions based on adjusted appliance surface area as a basis for minimum performance and Tier thresholds. Such an approach would more effectively responds to the inherent increase in efficiency as product sizes increase, and removes the potential for the perverse outcome of increased unit volumes improving apparent unit efficiency but increasing consumption.

Consider a technical study examining variations in standby modes

In general, existing energy efficiency standards have some Tier or minimum performance requirement related to the "standby" of the appliance. Typically these standards refer to a single standby mode; for example, "off-mode power" where a unit is plugged into the main power supply but the appliance is switched off. However, with the advent of microprocessor control and additional appliance functionality, an increasing number of appliances have varying standby modes. For example, televisions have "fully off," "standby with no activity," instant "on" functionality, internet connectivity, and so on – all of which have varying levels of energy consumption that are not currently captured by existing Chinese test methodologies.

Therefore, policymakers may wish to conduct a technical study examining appropriate appliances to establish the type and extent of standby modes currently available. This study, in combination with consumer research on typical usage patterns, should identify any additional standby modes that result in significant energy consumption and are commonly used by consumers. The results can then be integrated into the testing and energy efficiency standards for that appliance. Similar research is underway in other parts of the world and there is a potential for Chinese policy makers to collaborate with, or learn from, these studies.

Improve the collection of sales data

The analysis in this report was conducted on a product basis rather than a sales weighted basis due to limited access to sales data. This study found although the results

of sales and models analysis come close,[3] this has the potential to distort findings as, for example, particularly efficient or inefficient products may sell in significantly larger quantities than an average product on the market. If policymakers are similarly limited in their access to sales figures for products, it may lead to similar potential distortions in the analyses conducted for the development of energy efficiency standards and associated energy saving projections.

Therefore, policymakers may wish to consider following the examples of Australia, Canada, and Korea, and require suppliers of all appliances registered for sale within China to supply annual sales figures for those appliances, or to formally advise the China National Institute of Standardization that the products are not currently on the market.

Projected Potential Energy Savings

Based on projected growth in appliance ownership, changes in consumer usage patterns, product lifetimes, and other factors, the CLASP 2013 projections[4] suggest that the revision of energy efficiency standards detailed in each of the individual product analyses would likely result in cumulative potential energy savings of 269 TWh by 2030.

Similar projections estimate that, by 2030, *annual* energy savings of 187 TWh per year (with cumulative savings of 1,057 TWh) are possible should all future appliance sales match the efficiency of the most efficient representative model already on the Chinese market. In other words, even by adopting the revisions to the energy efficiency standards proposed in this study, huge potential energy saving opportunities remain available to policymakers based on existing technology already on the market.

[3] This study found the difference between analysis results based on sales and models is less than 10%.

[4] Energy Saving Potential (ESP) Study for Nine Appliances in China, CLASP 2013.