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List of Abbreviations

Acronyms	Meaning
AELE	Alliance for Energy Label Enterprises
AELTB	Alliance for Energy Label Testing Bodies
AMR	Administration for Market Regulation
AQSIQ	The General Administration of Supervision, Inspection and Quarantine (Merge into the newly established SAMR in 2018)
CEL	China Energy Label
CELP	China Energy Label Product
CNCA	Certification and Accreditation Administration of China (Deputy Ministry Level Governmental Body Affiliated to SAMR)
CNIS	China National Institute of Standardization (Research Body Affiliated to SAMR)
DRC	Development and Reform Commission
EEL	Energy Efficiency Labels
EES	Energy Efficiency Standard
ELEC	Energy Label Expert Commission
ELMC	Energy Label Management Center
ELP	Energy Label Product
GP	Green Product
MAEEL	The Measures for Administration on Energy Efficiency Labels
NDRC	The National Development and Reform Commission
QR	Quick Response
SAC	Standardization Administration of China (Deputy Ministry Level Governmental Body Affiliated to SAMR)
SASC	The State Accreditation and Supervision Commission
SAMR	The State Administration for Market Regulation
SAQSI	The State Administration of Quality Supervision, Inspection and Quarantine

1 Overview

This report addresses the energy labelling system in People Republic of China as well as its standards and regulations (namely Question 3 of the brief), by providing information on China Energy Label (CEL) regulation and Energy Efficiency Standard (EES), the CEL and the China Energy Label Product (CELP) management, experience, and areas for improvement.

The report covers 4 key areas:

- 1. Policy structure:** the background to China's work on CEL is discussed, the concepts of CEL and CELP are explained, and information is provided on policy structures, legal bases, management, and key stakeholders involved in the policy making process.
- 2. Implementation process:** The overall structure of how the CEL regulation and CELP management are implemented is detailed, as well as the key partners involved in CELP management and their respective responsibilities. Also, the current position on the standardization process is presented, including a list of the existing CELP standards, the process of certifying a CELP taking refrigerator as an example, and key stakeholders involved.
- 3. Energy Efficiency Standard (EES):** the EES concept is explained, followed by the requirements for its main content, history and development; finally, the present status, characteristics and functions of EES are highlighted.
- 4. China Energy Label Product (CELP):** the CEL policy system is explained, including the CEL regulation, the CELP scope and catalogue, the CEL enforcement mechanism, the areas for CEL improvement in comparison with Energy Star and EuP/ErP implementation and broader experience from the CEL implementation in China.

An outline of the overall policy framework is given, for readers to understand the evolving policy relevant to the CEL and CELP systems, as well as highlighting the relationship among all stakeholders.

A list of names and functions of the related government departments and the key organisations is included in the List of Abbreviation. Table 2 provides a full list of CELP standards (as of the end of 2020).

It should be noted that there is an important drawback to the findings of this report, as summarised in the following sections. This important drawback consists of a lack of thorough and consistent knowledge as to how the components explained in this report on CEL, CELP and EES - and in the second product policy-related report on "Green Product" implementation - are consulted upon and determined. The transparency of practices employed, and the "audit trail" backing up the decision-making for actual product groups could not be verified. The authors have also not been able to obtain clarity or detailed information as to how these mechanisms work in practice between the various actors, nor how the levels of ambition of measures are set. Likewise, consultation mechanisms within China remain largely unknown.

2 Background

2.1 Introduction and Concept

The China Energy Label (CEL) is a type of informational label attached to the product or its packaging, which indicates the energy efficiency grades, energy consumption and other indicators of energy-using products (see Section 2.1 for a fuller description). It is defined as “a type of informational label attached to the product or its packaging, which indicates the energy efficiency grades, energy consumption and other indicators of energy-using products”¹. Since it provides information on the energy consumption of the relevant product to all stakeholders, CEL is especially addressed to individual consumers, for use when making purchasing decisions, i.e., to help them to choose energy-efficient products but also to authorities and other bodies performing assessments or verifying compliances of goods with market regulations and environmental standards.

CEL was based on the experience of energy-saving and emission reductions in industrial sectors during the 9th & 10th Five-year plans. The CEL remit took into consideration further promoting energy-saving technological progress, as well as following international environmental protection and labelling trends, especially countermeasures to deal with climate change.

CEL certification is mandatory for *the energy-using* products sold, traded or used on the Chinese market. The CEL was adapted from the EU Energy Label. In fact, the legal framework of the CEL is supposed to be based - similarly to the EU Energy Label - on the principle of not differentiating between imported and domestically manufactured goods.

The establishment and implementation of the CEL is a complex system; it includes the legal framework construction and improvement of the present laws and regulations, the CEL working system and management procedures, the management responsibility and cooperation among relevant governmental departments, and the rights and obligations division of relevant stakeholders.

The origin of the CEL system in China could be considered to be the Measures for Administration of Energy Efficiency Labels (MAEEL) that were jointly released on 1st March 2005 - the first year of China's 11th Five-year Plan, by the National Development and Reform Commission (NDRC) and the General Administration of Supervision, Inspection and Quarantine (AQSIQ)². As will be explained in this report, the MAEEL specify the definition, implementation mode, management system, supervision and administration, penalties, and other provisions for CEL. The MAEEL technical basis could be considered that of the Energy Efficiency Standard (EES), which is defined as “a special kind of standard that sets detailed energy performance requirements without lowering the safety and performance requirements. The requirements are supposed to be proven to be technically feasible and economically justifiable, and to be beneficial to the consumer, whilst at the same time not harming the interests of the manufacturers”³.

The MAEEL specifies the Catalogue of Products Implementing CEL (hereinafter referred to as the CELP Catalogue) that is developed and formulated by the National Development and Reform Commission (NDRC), jointly with the State Administration of Quality Supervision, Inspection and Quarantine (SAQSI) and the State Accreditation and Supervision Commission (SASC) (NB now merged as the State Administration for Market Regulation (SAMR)).

¹ The regulation was first issued on 13th August 2004 and updated by the 1st June 2016 by NDRC and AQSIQ

² AQSIQ was merged into the newly established the State Administration for Market Regulation (SAMR) in 2018.

³ The Measures for Administration of Energy Efficiency Labels.

Additionally, the CELP Catalogue, and the Rules for Implementing Relevant Product Labels establishes the products covered, and the rules that standardise the label format specifications, product and labelling testing requirements, CEL-related information filing procedures and verification requirements for labelling of specific products. According to the MAEEL, the CEL must provide the following information:

- Name, or its shortened form, of the manufacturer of the product;
- Product model;
- Energy efficiency level of the product;
- Energy consumption of the product;
- Code of the national standard applied.

The NDRC hosts inter-departmental meetings to coordinate the CELP catalogue and to decide on the development of standards development, CEL rules for management and CEL specifications. The goal is to develop uniformly applicable energy efficiency standards, implementation rules, patterns and specifications for the CEL. On 29th November 2004, the NDRC, SAQSI and SASC together issued the Catalogue of Products Implementing EEL in China (the first batch), the Basic Styles of CEL, the Implementation Rules of CEL for the air conditioner and the Implementation Rules of CEL for household refrigerators in accordance with the MAEEL. Subsequently, over the intervening 16 years, successive Catalogues of Products have been released (approximately on a rolling 12–18-month basis, with varying dates), with associated numbered CEL product batches.

The CEL for air conditioners and household refrigerators was enforced on 1st March 2005. Since then, the second batch of the Catalogue of Products Implementing EEL was issued and enforced on 1st March 2007. By April 2020, the 15th batch of the Catalogue of Products Implementing EEL had been issued and enforced.

The establishment and development of the EES system over time is explained in Ch. 3.

As a result of the cooperation between all the relevant stakeholders⁴, the CEL system in China has expanded, achieving the following three significant results, to date:

- 1) The scope of China Energy Label Products (CELP) and the products with a CEL displayed has expanded rapidly. Energy efficiency labelling of products in China relates to energy-consuming products with performance indicators, such as the energy efficiency rating, which is displayed on their packaging. China's mandatory implementation of energy efficiency products comprised the following groups of products (2018 status): electronic displays, LCD TV, plasma TV, electric cooker, induction cooker, household washing machine, refrigerator, water storage type electric water heater, energy-saving lamp, high-pressure sodium lamp, printer, copier, electric fan and air conditioning.
- 2) Nowadays there are a total of 15 CELP catalogue⁵ batches of products, which were in the process of being approved by NDRC, AQSIQ and CNCA according to the policy of “progress in industrial upgrading”, covering more than 37 product categories in 5 areas: household appliances, industrial equipment, lighting appliances, commercial use appliances and office electronics⁶. More than 1.5 million individual products have been granted a CEL, more than 15 000 companies supply products with the CELP

⁴ For the roles and responsibilities of relevant stakeholders, please refer to the 2.3 and Chart 1.

⁵ CELP catalogue is published by the NDRC.

⁶ CELP covered by each area please refer to Table 1.

label to the market and 1 191 testing laboratories have been registered on the CEL online platform⁷.

Since its launch, the implementation of the CEL programme has contributed to energy savings, and to the reduction of pollution in China. The CEL system is designed to play an important role in encouraging technological innovation related to energy efficiency; it also encourages improving energy consumption amongst the general public through incentives e.g. price discounts, such as “replacing the old with the new”⁸ products. The IEA’s efficiency policy progress index⁹ shows that China accounted for more than half of the world’s total policy progress 2000-2016. In addition, the China National Institute of Standardization (CNIS)¹⁰ has estimated that the implementation of the CEL system over the past 14 years has saved more than 442 billion kWh electricity, which in China’s case they cite as equating to saving some 180 million tons of standard coal, 443 million tons of carbon dioxide (CO₂) emissions and 13.3 million tons of sulphur dioxide (SO₂).

- 3) The CEL system has legal support from the Law of Energy Conservation (2008), which sets out the legal basis for CEL as an important component of energy conservation regulations, outlining the management arrangements, contents, and penalties for the CEL system. Separately, but associated with CEL and CELP, are the Law of Product Quality and the Certification and Accreditation Regulation. Under these latter two legal regimes, fines can be imposed on those responsible entities that do not attach the CEL as required (individuals or companies). Criminal penalties (including potential imprisonment) can be imposed on any companies/individuals that use a counterfeit or fake CEL.

The above system is “policed” by the regional administrative departments for energy conservation under the people’s governments at the provincial, municipal, and county levels, together with the local quality and technology supervision departments and the exit inspection and quarantine institutions of all localities.

2.2 Legal Basis

The legal basis for the CEL comprises a series of laws: the Law of Energy Conservation¹¹; the Law of Product Quality¹²; and the Regulation on the Certification and Accreditation¹³. These laws outline the *principles* by which the CEL system is governed and cover the following aspects: legal basis, administrative and law enforcement bodies, technical support, product inspection and labelling requirements. The Law of Energy Conservation establishes the legal basis for the *implementation* of CEL and requires enterprises to indicate technical parameters such as energy consumption on the labels for energy-using products (which represent the energy-saving obligations of producers).

⁷ CEL online platform - <http://www.energylabel.gov.cn>

⁸ Replacing the old with the new means that when consumers buy new goods, they can receive discounts (via “discount coupons”) on new goods, if they return the same type of old goods to the stores. This policy was promoted by the State Council as from 2009 and led by the Ministry of Commerce.

⁹ The IEA Efficiency Policy Progress Index (EPPI) combines coverage and strength of codes and standards into single index for measuring overall policy progress. The EPPI covers seven energy end-uses: space cooling, space heating, appliances, water heating, industrial motors, lighting, LDVs and HDVs. For detail on methodology, see IEA website: <https://www.iea.org/reports/energy-efficiency-2017>

¹⁰ According to statistics and calculation by China National Institute of Standardization (CNIS).

¹¹ June 1986

¹² September 1993

¹³ September 2003

Separately, the Law of Product Quality provides the labelling requirements for product labels and the principal provisions in relation to legal enforcement. The Regulation on the Certification and Accreditation provides the rules and details supporting the implementation of the CEL system in China, covering (inter alia) the professional technical inspection procedures, such as the issuing of the certificate approval, as well as the revocation/ cancellation¹⁴ procedure of the certificate, where applicable.

On the basis of the above laws and regulations, the Measures for Administration of Energy Efficiency Labels (MAEEL) specify the definition, implementation mode, management system, supervision and administration, penalties, and other provisions for energy efficiency labels. In order to implement the MAEEL, the Catalogue of Products¹⁵ and the detailed requirements for its implementation comprise the matching rules for execution that standardize the format specifications, testing requirements, filing procedures and verification requirements for labelling of specific products.

A 2015 paper analyzing barriers of CEL system showed the legal basis is outdated and does not reflect market evolutions¹⁶. As mentioned in Section 1, the lack of knowledge as to how the above elements are consulted upon and set represent an important limit of this research. It must be stressed the transparency of practices employed, and the “audit trail” backing up the decision-making for actual product groups remains unknown. Therefore, further research should aim at understanding how these mechanisms work in practice between the various actors, and/ or how the levels of ambition of measures are set.

2.3 Stakeholders and Respective Responsibilities

This section explains various actors playing a role in the CEL system. Their roles are graphically depicted in Chart 1 (see end of Section 2).

Governmental departments

The administrative subject of CEL is divided into two levels: national and local. Concerning the first national levels, three main departments are involved:

- NDRC and the State Administration for Market Regulation (SAMR) are responsible for the establishment and overall management of the CEL system, including the formulation and publication of the periodically revisited CEL Catalogue of Products, and the stipulation of the uniform application of energy efficiency standards, implementation rules and specifications of CEL. (NB Collaboration with the MIIT to ensure computability of these measures with the Green Design Product system is supposed to occur, but no details of these mechanisms have been forthcoming during the preparation of this report.)
- The Certification and Accreditation Administration of China (CNCA) is responsible for developing the CELP catalogue and the management of testing laboratories.

¹⁴ In the case of any violation of the provisions, the authorised authority shall revoke the relevant label, and record that the producer or importer of the product no longer has the necessary qualified energy efficiency requirements for the product concerned. The authorized authority shall also make a timely announcement.

¹⁵ The Catalogue of Products that include CEL is published by NDRC jointly with AQSIQ and CNCA. Its purpose is to announce the list of products qualified with the CEL.

¹⁶ Li, P., Xia Y., Lin L., Peng Y., 2015, Assessment of compliance scheme of China Energy Labeling Program.” Presented at the 8th International Conference on Energy Efficiency and domestic appliances and lighting. Lucerne-Horw, Switzerland: 6 o 8 August 2015.

These governmental departments – NDRC, SAMR and CNCA - host inter-departmental meetings to coordinate the CELP catalogue and to decide on the development of standards, CEL rules for management and CEL specifications.

The administration of the CEL system at the local level includes all the administrative departments of energy conservation under the governments at the provincial, municipal and county levels. The local quality inspection departments are mainly responsible for the supervision and law enforcement of the CEL system in the investigation and punishment of relevant illegal acts. In addition, authorized institutions are responsible for the registration, verification and announcement of CEL under the authorization of the NDRC and the State Administration for Market Regulation (SAMR).

For clarity, it should be noted that the China National Institute of Standardization (CNIS) is the research body affiliated to SAMR. The CNCA (Certification and Accreditation Administration of China) is the deputy ministry level governmental body affiliated to SAMR.

Authorised bodies¹⁷

CNIS¹⁸ is authorised by NDRC to record and manage CELP information. The overall role of the NDRC is to hosts inter-departmental meetings to coordinate the CELP catalogue and to decide on the development of standards development, CEL rules for management and CEL specifications.

In 2005, the CNIS set up the Energy Label Management Center (ELMC). Producers and importers of energy-consuming products listed in the Catalogue (see above) need to submit the energy efficiency identification and related information for recording and documentation to the ELMC.

Energy-consuming products produced, sold and imported into China must be labelled with energy efficiency labels. As such, non-Chinese manufacturers have to submit the relevant information and pass the relevant tests associated with the CELP procedures.

In 2006, the ELMC set up the Energy Label Expert Commission (ELEC), the Alliance for Energy Label Enterprises (AELE) and the Alliance for Energy Label Testing Bodies (AELTB). The current state of play of respective roles of these organisations is explained below; it should be noted that this still needs to be studied more in detail in order to obtain a much fuller understanding of how these organisations and mechanisms work – and inter-relate - in practice.

- ELEC is a consulting organisation and promotes the implementation of the CEL system. It has 16 working groups and 280 members from government departments, research institutions, associations, testing bodies, and CEL-related manufacturers and distributors.
- AELE is an enterprise self-regulatory organisation (a type of trade association), in which the enterprises whose products are subject to the CEL, according to our understanding work together to liaise with the authority and follow up on the credit system of CELPs. It consists of 38 members from industrial sectors who are included in the CELP catalogue of products. AELE aims to develop the CEL credit system to support ELEC and facilitate information sharing of technologies with high energy efficiency. It remains unclear as to what extent AELE is a fully independent

¹⁷ The bodies here refer to those agencies who are authorised by the governmental departments to assist the implementation of MAEEL.

¹⁸ CNIS (China National Institute of Standardization) is the research body affiliated to SAMR (The State Administration for Market Regulation). CNCA (Certification and Accreditation Administration of China) is the deputy ministry level governmental body affiliated to SAMR.

supervisory organization, and how the referred system of credits functions, and which entities grant benefits, and which organisations, manufacturers or individuals receive benefits from these credits.

- The AELETB is a voluntary organisation composed of 16 testing bodies. The aim of AELETB is to improve the quality and authority of industry testing services related to CEL. Again, this research has not been able to verify the independence of the AELETB, nor its working practices.

Other stakeholders

- Enterprises of the products concerned play the most important role in the implementation of CEL such as the testing of product energy efficiency, the determination of labelling information, as well as the printing of and use/ affixing/ online publication of labels;
- The seller should ensure that the CELP sold are properly labelled;
- The testing institution is responsible for the testing of product energy efficiency information;
- Consumers are not only the target group of labels, but also the important power of social supervision of signs.

Supervision bodies

The local branches of NDRC are the Development and Reform Commission (DRC) and operate at the provincial and municipal level. These local DRC branches are responsible for implementing energy-conservation and CEL policies set by NDRC.

The local branches of the SAMR are the Administration for Market Regulation¹⁹ (AMR), which operate at the provincial and municipal level; they are responsible for CEL market supervision and regulation enforcement.

The DRC and AMR are the main bodies in charge of supervising and managing the use of CEL in the areas under each jurisdiction, and together they monitor and supervise energy-consuming products listed in the CEL placed on the market on the Chinese market by manufacturers and importers.

As other studies have shown, the high number of institutions and the outdated legal basis makes coordination difficult²⁰. There is also a lack of transparency with regard to the level of ambition of the individual product laws in China, perhaps related to a lack of stakeholder participation and consequent objective reporting on the CEL system²¹. An important limitation of this research has been understanding this complex network and the level of participation of each player in the policy-making process. Hence, any consultation mechanisms between Chinese government ministries and trade associations, foreign manufacturers' importers, Chinese civic society, environmental NGOs etc. should be studied.

2.4 CEL system - working framework

The MAEEL states that the NDRC, CNCA and SAMR (previously AQSIQ) are jointly in charge of the launching and enforcement of CEL at the central government level. The Catalogue of Products Implementing Energy Efficiency Labels ("the Catalogue") are developed and

¹⁹ They are the local branches of NDRC and SAMR at the provincial and municipal level.

²⁰ Li, P., Xia Y., Lin L., Peng Y., 2015, Assessment of compliance scheme of China Energy Labeling Program." Presented at the 8th International Conference on Energy Efficiency and domestic appliances and lighting. Lucerne-Horw, Switzerland: 6 o 8 August 2015.

²¹ Zhou N., Khanna N. Z., 2017, "Lessons learned from international energy labelling programs for strengthening the China Energy Label program", ECEEE Summer Study Proceedings.

formulated in batches, which stipulate uniformly applicable energy efficiency standards, implementation rules, and specifications of energy efficiency labels. The products listed in the Catalogue must comply with MAEEL and related standards.

The ELMC (administered by CNIS) is authorised to manage the information on CELPs with the cooperation of industrial associations. The ELMC also cooperates with the local DRCs and AMRs who are responsible for the market surveillance and inspection of the CELPs. In addition to working together with the industrial associations, the media (newspapers and online media) has a role to play in relation to information disclosure.

The media work together with governmental departments on several issues, such as:

- the publication and dissemination of the CELP Catalogue;
- the name of enterprises who have not complied with MAEEL (via a “name and shame” policy²²); and
- related rules or other news related to CEL.

The ELEC and AELE help those enterprises which wish to apply for the CEL with technical consultancy services, and the ELMC also provides technical support. The testing bodies provide verification and testing services related to the energy efficiency indicators with which products must comply. The following Chart 1 shows this working framework.

²² In addition, if the manufacturer/ importer has a product which is found to be in non-compliance, the product must be withdrawn from the Chinese market.

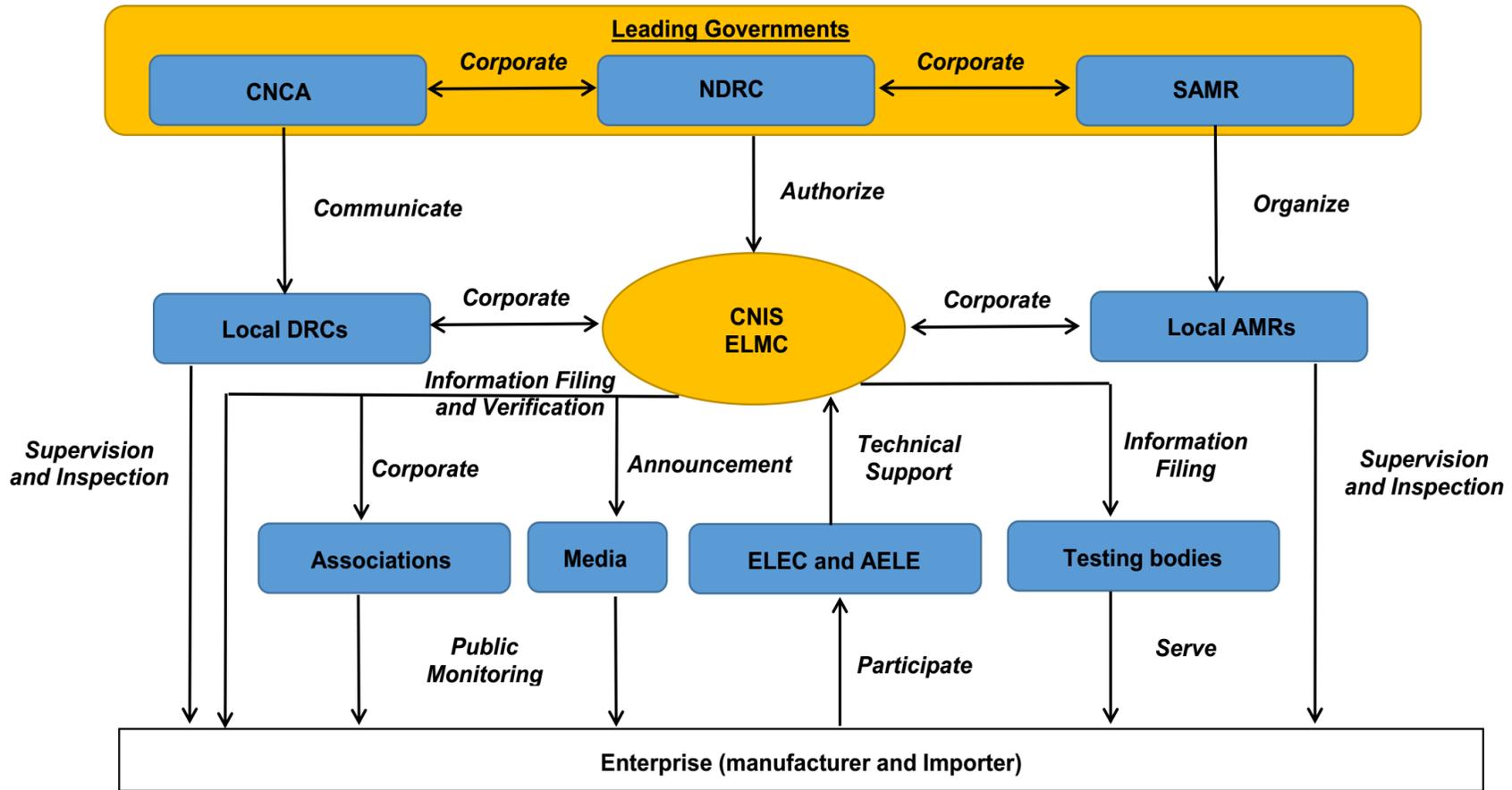


Chart 1. CEL System working Framework (Prof. Jin Min Renmin University of China)

3 Energy Efficiency Standard

3.1 EES history and development

The development of Energy Efficiency Standards (EESs) in China has gone through four stages: 1) the initial stage in the 1980s; 2) the steady development stage in the 1990s; 3) an improvement stage in the early 2000s; and 4) the energy efficiency index stage.

The first batch of nine EESs for household appliances, including household refrigerators and air conditioners, were approved and issued on 25th December 1989, and were formally implemented on 1st December 1990.

The second stage was from 1995 to 2000; this stage included coverage of more products, including lighting and industrial equipment. Moreover, the energy-saving evaluation indicator (showing how much energy is saved) was established within the EES.

From 2001, in the third stage, China established a "standard system of resource conservation and comprehensive utilisation" by referring to the successful experience of such related policies in European countries and in the United States. China has made positive progress in the development of energy efficiency standards through the joint efforts of scientific research institutes, manufacturers and experts in related fields. In this period, the so-called "*reach*" target energy efficiency value (also called the "reach efficiency threshold")²³ and the *energy efficiency grades indicators* were established and brought into the EES index.

In 2008, CNIS began to research the leading energy efficiency indexes for office devices, which later evolved into the "China Top Runner Standard" scheme in 2018. The "China Top Runner Standard" scheme was developed according to the "Opinions on Implementing the 'Leader' Scheme of Enterprise Standards". The "Opinions..." actions were initiated and issued by SAMR, jointly with NDRC, the Ministry of Science and Technology (MIIT), the Ministry of Finance, the Ministry of Ecology and Environment, the Ministry of Transport and the People's Bank of China and the eight governmental departments.

The Energy efficiency "Top Runner" scheme refers to the product or enterprise with the highest energy efficiency in a comparable range of similar products and must adhere to energy efficiency standards that are stricter than national standards. In the 'Leader' Scheme, the enterprise which sets the standard with the leading energy efficiency value is published and communicated to the public. This performance standard is supposed to form the basis for qualifying for green fiscal and financial assistance, such as the green approval channel (see below), preferential interest rate and quota guarantee for loans.²⁴

The "green approval channel" refers to the establishment of a "green channel" of administrative examination and approval services for enterprises, involving the buying and selling of real estate, the transfer of state-owned assets, payments of taxes and fees, confirmation of state-owned and collective property rights and other historical issues.

²³ The "reach" target energy efficiency value is a target value set for a three- or five-year period. After the stipulated period (3 or 5 years), the "reach" target becomes the "limited" value (understood to mean an Ecodesign-style minimum threshold). The aim is to encourage enterprises to upgrade their technology over time.

²⁴ This means the "top runner" enterprises will be given a *green approval* channel, preferential interest rate and quota guarantee by the banks.

3.2 Main content and classification of EES

EES is the minimum energy efficiency standard for end-use²⁵ energy products developed under the national energy saving and comprehensive utilization standard system. It seems to represent a minimum threshold, i.e., a mandatory minimum performance threshold below which products cannot be placed on the market in China. The EES specifically focuses on energy-using products, including general industrial equipment, household appliances, commercial equipment, electronic information products, transportation and agricultural equipment, etc. The EES is formulated by the Energy Foundation and Management Standardization Technical Committee under the SAC.

EESs are compulsory national standards. The main contents of EESs include four indicators:

(1) the minimum allowable value of energy consumption (minimum energy efficiency value or energy efficiency limited value, in the 1989 version), (2) the energy-saving evaluation value, (3) energy efficiency grades and (4) the target energy efficiency indicator. The target energy efficiency indicator refers to the maximum allowable value of energy consumption (minimum energy efficiency value or energy efficiency limited value) and is the core and compulsory market-access indicator²⁶. The energy-saving evaluation value is the indicator to evaluate whether products meet the certification requirements of energy-saving products. The energy efficiency grades indicator is the (Energy Labelling) level indicator of the energy-using products. The target energy efficiency indicator refers to the energy efficiency limit value (advanced indicator) which is implemented three or five years after the initial EES is enforced.

The “Energy-Efficiency Label Management Approach” has divided the energy efficiency of end-use energy products into 3-grade energy efficiency or 5-grade energy efficiency. There are two classifications of grading level to classify energy efficiency depending on the type of products: 1) 1-3 levels, and 2) 1-5 levels. Level 1 is the highest level of energy efficiency of products, and Levels 3 (first system) or 5 (second system) indicate that the product has reached the energy efficiency limit value, that is the threshold for market access. Products below the limit value required in the EES (i.e., either level 3, or level 5, depending on the system) are not permitted to be sold on the market²⁷.

The *reach target energy efficiency indicator* is set and promotes higher energy efficiency technology; it seems to be currently mainly aimed at air conditioner products. The “reach target” period of 3 to 5 years leaves time for enterprises to improve product technologies and to upgrade the energy-saving level of products. The energy-saving evaluation value, energy efficiency level(rating) and target energy efficiency value are the recommended indicators. EES is the technical basis of energy-saving product certification and the CEL system in China.

EES can be classified into 6 types of standards:

- 1) Instructive standard,
- 2) Minimum energy efficiency standard (MEPS),
- 3) Class-average standard,
- 4) Energy rating standard,

²⁵ By end use products we intend the main use of the products produced by any given enterprise, not to be used for other purposes

²⁶ Zhou N., Khanna N. Z., 2017, “Lessons learned from international energy labelling programs for strengthening the China Energy Label program”, ECEEE Summer Study Proceedings.

²⁷ Zhang, G., Zhang, C., & Nie, H. (2021). An Overview of China’s Energy Labeling Policy Portfolio: China’s Contribution to Addressing the Global Goal of Sustainable Development. SAGE Open, 11(1), 2158244020988858.

- 5) Test method standard and
- 6) Checking and inspection rules standard.

EES can also be classified by the difference of time and index level into two types:

- 1) Present status standard and
- 2) Reach target standard.

3.3 Characteristics and functions of EES

Compared with other product standards, the EES have the following particular characteristics:

- A focus on the energy saving performance of products;
- energy saving performance is quantified and verified;
- They aim to consider the best available energy-efficiency technology on a cost-benefit basis;
- Aim to continuously improve manufacturers' and importers' energy-efficiency technical upgrading of products.

The benefits of EES to stakeholders are as follows:

- Consumers: EES increases the overall benefits of energy-efficient products to consumers without over-restricting consumer product choices.
- Manufacturers: EES helps manufacturers to further regulate the market to form a level playing field for fair competition, simultaneously promoting a healthy and high-technology competition among manufacturers. This mechanism should also help to improve manufacturers' competitiveness in the market. ²⁸
- Government: EES reduces the investment required in energy supply infrastructure (via the provision of less-consuming energy-efficient products on the market), reduces pollutant emissions and protects the nation's ecological system and environment.

3.4 Current status of EES

By the end of 2020, a total 15 batches of EESs covering more than 73 types of products had been issued and implemented in China. It is assumed that the EES is updated in tandem with the CEL batches According to the ELMC and CNIS, as of October 2016, China had developed and implemented 68 EESs, of which 20 covered household appliances, 13 covered lighting equipment, 11 covered commercial use devices, 19 were covering industrial equipment, and 5 covered office equipment. In summary, these standards cover 5 overall product groups (see Table 1 below).

²⁸ It is not clear from this research what access to this information non-Chinese companies have in advance of the implementation date of the measure, or during the negotiation phase (or if indeed a transparent 'negotiation' phase takes place, with consultations etc). To date, it is also not clear what steps non-Chinese manufacturers have to go through, and at how many national and regional levels, in order to provide proof that their products meet the EES.

**Table 1. Scope and Number of energy efficiency standards
(in total 73 EESs for 73 types of products)**

Groups	Types of Products	Number
Home appliances	Household refrigerator, room air conditioner, electric washing machine, colour TV, electric fan, rice cooker, electric water heater, gas water heater, inverter air conditioner, electromagnetic cooker, flat panel TV, microwave oven, solar water heating system, range hood, heat pump heat Water machine, set top box, water dispenser, household gas cooker, AC ventilation fan	20
Lighting equipment	Fluorescent lamp ballast, double-ended fluorescent lamp, single-ended fluorescent lamp, self-ballasted fluorescent lamp, high-pressure sodium lamp, high-pressure sodium lamp ballast, metal halide lamp, metal halide lamp ballast, single-ended electrodeless fluorescent lamp, AC electron for single-ended electrodeless fluorescent lamp Ballast, self-ballasted electrodeless fluorescent lamp, self-ballasted LED lamp, tungsten halogen lamp, LED luminaires for road and tunnel lighting	14
Office equipment	Computer monitors, copiers, printers and fax machines, external power supplies, microcomputers, projectors	5
Commercial Use devices	Air cleaners, Unit air conditioner, multi-connected air conditioner, chiller, remote condensing unit refrigerated display cabinet, lithium bromide absorption chiller, commercial gas cooker, water (ground) source heat pump unit, hydrogen refuelling station, low ambient temperature air source heat pump (cold water) unit, duct air supply unit, unit air conditioner, Ducted air conditioners	13
Industrial equipment	Permanent magnet synchronous motors, Small and medium-sized three-phase asynchronous motor, air compressor, ventilator, clean water centrifugal pump, distribution transformer, power transformer, AC contactor, industrial boiler, small power motor, centrifugal blower, arc welder, heating furnace for oil industry, Permanent magnet synchronous engine, high-voltage three-phase cage asynchronous motor, small submersible pump, well submersible pump, sewage submersible pump, petrochemical pump, Low ambient temperature air source heat pumps.	21

Source: Statistics from the ELMC with CNIS, 2015.7 and <https://www.ul.com/news/china-new-ee-standards-and-announcement-15th-batch-cel-product-implementation-guidelines>

4 “New” China Energy Label (CEL) & Measures for the Administration of the Energy Efficiency Labels (MAEEL) from 2015 onwards

4.1 “New” MAEEL (CEL)

In August 2015, ten years after the implementation of MAEEL, NDRC and SAMR issued a revised version of MAEEL to promote higher efficiency and energy-saving products, in accordance with the Law of Energy Conservation and the Action Plan for Energy Conservation and Emission Reduction and Low Carbon Development (2014- 2015). On 1st October 2016, a new CEL with a QR code format was launched²⁹.



Chart 2. Sample of CEL without Top Runner Logo

The main changes were as follows:

- 1) The Law of Import and Export Commodity Inspection (LIECI) was added as a fourth pillar of the legal basis alongside the previous three laws³⁰. In addition, CNIS under the authority of the NDRC was appointed to be responsible for the documentation of information related to CELP. The revised MAEEL highlighted that the requirements for information sharing are the responsibility of the local AMRs and DRCs.
- 2) The requirements for energy-using category products sold through the internet online were added in the general provisions. It is clearly required that the corresponding CEL should also be displayed in a prominent position of the main product information display page.

²⁹ The left part of Chart 2 shows the QR code and the right part shows the specification for printing the CEL.

³⁰ Law of Energy Conservation, the Law of Product Quality, the Regulation Certification and Accreditation

- 3) The most significant change in the new MAEEL is the addition of a QR code. Consumers and governmental departments can scan the QR code (see Chart 2) and enter the EEL identification information platform to obtain energy efficiency information, an energy efficiency record number, the result of an energy efficiency sampling check and the quality control of the energy-using products. The platform is operated by CNIS, and integrates knowledge about energy-saving, instructions for cleaning products, product maintenance and recycling, and information on how to select, use, repair and replace products throughout their life cycle. The “Top Runner” logo for products listed in the national energy efficiency “Top Runner” catalogue should also be added in the new CEL if the products have achieved the qualifying high energy efficiency levels 3).



Chart 3. Sample of CEL with Top Runner⁶¹ Logo

- 4) All manufacturers and importers who use their own laboratories for testing are responsible for the testing results, and bear corresponding legal responsibilities even if they use a third-party’s test results. Those manufacturers/ importers who use third-party inspection and testing bodies need to ensure that the testing results are objective, fair, true and accurate, and that they ensure commercial confidentiality of the products and enterprises under inspection. This is an important legal provision of the documentation record system.
- 5) The CNIS is authorised to undertake the following mandatory verification checks:
- Verification of Energy Efficiency Labels and energy efficiency inspection and testing report of the products from the manufacturers and importers in an objective, fair and open way;
 - Document a record of the EEL within 10 working days from the date of receipt of the completed and submitted information provided by the manufacturers and importers and publish the samples of the EEL within 5 working days from the date of documentation record. In addition, the CNIS must update the documentation in a timely manner.
 - Cancellation and announcement of any non-qualifying documentation records.
 - Ensuring commercial confidentiality for the manufacturers and importers.
- 6) The NDRC, AQSIQ and SASC (which were merged into the SAMR) have the responsibility to establish the credit records. Those enterprises which are in violation of the new MAEEL are recorded by the CEL credit information platform and are then incorporated into the national Credit System for nationwide information sharing.

³¹ China’s “Top Runner” programme aims to highly identify energy-efficiency product models and benchmarks for some energy-intensive industrial sectors. The evaluation and selection of the “Top Runner” energy efficiency products is held once a year. The finalized list of successful products is published on the websites of NDRC and SAMR

By using the information platform and QR code, the CELP documentation record may be thus maintained online without the need for paper documentation to be submitted. The platform integrates information from more than 1.5 million individual CELPs, 15 000 CELP manufacturers and importers and 1 191 inspection and testing bodies. To date, it has been estimated that the CEL information platform has provided a service for around 520 million actual CELP products and has resulted in information searching via QR Codes with 55 million users, since the platform can also be accessed via mobile devices.

4.2 Scope of CELP

Within the 73 types of products of EES (Table 1), CNIS developed CEL Specification for certain types of products. There are currently 37 categories of products covered by CEL, published in 14 batches of the CELP Catalogue by NDRC and SAMR. (previously the AQSIQ and ANCA).

Table 2. List of CEL Product Types

No. Of Batch	No. of Product Types	Product Types	Published	Implementation date
The 15 th Batch	5	<ul style="list-style-type: none"> ● New Product Types: Permanent magnet synchronous motors, Air cleaners, LED luminaires for road and tunnel lighting, Ducted air conditioners, Low ambient temperature air source heat pumps ● Modified specifications on: Unitary air conditioners, Room air conditioners, LED products for indoor lighting 	27 th April 2020	1 st July and 1 st November 2020
The 14 th Batch	2	<ul style="list-style-type: none"> ● New Product Types: Ventilation fan, self-contained commercial freezer ● Modified specifications on: rice cooker, microwave oven 	19 th December, 2017	1 st June, 2018
The 13 th Batch	2	<ul style="list-style-type: none"> ● New Product Types: Projector, LED lamp ● Modified 33 products specifications for CEL 	5 th July, 2016	1 st October, 2016
The 12 th Batch	4	<ul style="list-style-type: none"> ● New Product Types: Household gas cooker, commercial gas cooker, water source heat pump unit, lithium bromide absorption chiller 	26 th May, 2015	1 st December, 2015
The 11 th Batch	2	<ul style="list-style-type: none"> ● New Product Types: Range hood, heat pump water heater ● Modified specification on: Induction cooker, copier, printer, fax machine 	29 th September, 2014	1 st January, 2015
The 10 th Batch	1	<ul style="list-style-type: none"> ● New Product Types: Microcomputer 	14 th November, 2012	1 st February, 2013
The 9 th Batch	2	<ul style="list-style-type: none"> ● New Product Types: Solar water heater, Refrigeration display case 	21 st June, 2012	1 st September,

				2012
The 8th Batch	2	● New Product Types: Printers and fax machines, digital TV receivers	19 th August, 2011	1 st January , 2012
The 7th Batch	2	● New Product Types: Flat-screen TV, microwave	15 th October, 2010	1 st March, 2011
The 6th Batch	2	● New Product Types: Power transformer, fan ● Modified specification on: Room air conditioner	12 th April, 2010	1 st June, 2010
The 5th Batch	5	● New Product Types: Automatic rice cooker, AC fan, AC contactor, positive displacement air compressor ● Modified specification on: Household refrigerator	26 th October, 2009	1 st March, 2010
The 4th Batch	4	● New Product Types: Speed controllable room air conditioner, multi-split air conditioner (heat pump) unit, water storage type electric water heater, household electromagnetic cooker, computer monitor, copier	17 th October, 2008	1 st March, 2009
The 3rd Batch	5	● New Product Types: Self-ballasted fluorescent lamps, high-pressure sodium lamps, small and medium-sized asynchronous motors, chillers, gas water heaters	18 th January, 2008	1 st June, 2008
The 2nd Batch	2	● New Product Types: Washing machine, unit air conditioner	18 th September, 2006	1 st March, 2007
The 1st Batch	2	● New Product Types: Household refrigerator, room air conditioner	29 th November, 2004	1 st March, 2005

Source: detail information about batches 1-14 can be found at:

<https://www.135995.com/145/114530.html> ; information on batch 15 can be found at:
<https://bit.ly/2OIngpl>

In China the EESs for CELPs have been developed gradually. At present, not all products have EESs. The NDRC, together with other governmental departments and CNIS, will research and develop the EES for products step by step. After a batch of EESs for CELPs has been developed, the NDRC publishes a Catalogue of Products that are communicated to the public and other stakeholders.

4.3 Catalogue of CELP

The selection of each batch of products considers achievable advances in energy-saving technologies and whether they have a wide range of uses, markets, and whether they have a sufficiently large energy-saving potential to merit their consideration. The basic principle of the CELP catalogue screening is to identify those products that present the greatest potential for energy conservation and wider use, and which mainly considers the effect and

cost-effectiveness of implementation". The following factors are considered in the formulation of the CELP catalogue:

- Requirements of the relevant existing laws, regulations and policies;
- Production and import and export volume;
- Energy consumption of products (including the energy efficiency distribution in the market) and energy-saving potential;
- Market management rules for the products and self-discipline of the corresponding industrial sectors;
- The impact on stakeholders and their concerns;
- The existence of technical specifications of the products such as the existence of the national energy efficiency standards and national energy efficiency inspection and testing standards), together with the consideration of the present testing laboratory capacity, etc.;
- Implementation experience from other countries.

4.4 Implementation Model and Procedures

The implementation model for the CEL includes three steps: 1) enterprise self-declaration; 2) submission of CELP file/input and documentation record; 3) publication of CELP and market supervision. These steps are explained below:

1. **Enterprise self-declaration** of the CELP is a key feature of CEL system. China reduces the administrative burden on manufacturers by permitting the use of self-certification statements designed for the CELP. The new MAEEL also aims to help producers formulate a credit system in the future. The main responsibilities of the self-declaration process for the manufacturers are:
 - The manufacturer is responsible for product testing;
 - The manufacturer should benchmark product inspection and testing results with the corresponding EES for rating, and determine the energy efficiency grade (level 1-3) of the CELP;
 - The manufacturer should provide the inspection and testing reports and complete the registration for each model for which they wish to display a CEL, as well as in putting the file/input information as required for the documentation record into the CEL information filing platform³².
 - The manufacturer prints the CEL in line with the requirements including the necessary product information required by the specification of CEL standard for the corresponding type of product, and attaches the printed CEL as required;
 - The manufacturer is responsible for ensuring that the product is correctly labelled, under the supervision of, and inspection by relevant government departments and the corresponding local supervision bodies.
2. **File/input and documentation record** is the main information tool for CEL management. This includes two steps: information verification and CELP announcement. The information verification procedure includes verification by ELMC, managed by CNIS on product energy efficiency, as derived from the enterprise self-testing or the third-party testing.

³² CEL filing platform - www.energylabel.gov.cn

3. Once the CELP file/ input by the enterprises is verified by the ELMC – as managed by CNIS - the CELP is announced on the official website of CEL (the information platform, as described above). When filing, the ELMC does not conduct a technical examination or approval of the energy efficiency files as input by the relevant enterprise, but solely verifies the CELP information that the enterprise has input into the database. After completing the verification of the record, ELMC records the CELP document and announces the CEL logo for the recorded product, so as to facilitate market surveillance. The new MAEEL requires the enterprises to inform the ELMC of the correct information on a product's energy efficiency, and to comply with their associated legal responsibilities.
4. **Market Surveillance and Inspection** is the guarantee for the effective implementation of the CEL system. It incorporates three forms of market supervision:
 - I. Special inspection by government departments, primarily by the local DRCs and AMRs, which are responsible for MAEEL enforcement of production. With regard to the market, the DRCs and AMRs deal with consumer complaints, monitoring any violations, and they also determine and impose penalties based on any violations.
 - II. Market spot-checking investigations are completed by the ELMC (managed by CNIS), for which they are jointly responsible with local DRCs and AMRs. They are responsible for dealing with the inquiries, complaints and feedback from the consumers and other stakeholders, as well as developing and operating the EES, CEL and CELP-related database. The ELMC is also responsible for conducting spot-check investigations on the CELPs in the market to assure the EES and CEL compliance; disseminating the EES, CEL and CELP knowledge and assessing the implementation results; and for training the public for participation in social monitoring. This last-mentioned aspect refers to assisting the public's comprehension of the new EES and updating the issued EES for the expansion of CEL and CELPs, together with putting forward recommendations to the governmental departments about how to improve the administration for the CEL system.
 - III. Social supervision by consumers, supermarkets and other retailers, suppliers, industrial associations and manufacturers are all part of the public monitoring system. For example, if a consumer finds a problem with one CELP, s/he can log in to the information platform (the official energy label web site) and check the related information according to the record number of the logo or dial the hotline of ELMC to make a verbal complaint. With the issuance and enforcement of the new MAEEL, the QR code provides an easier way to assist the social supervision of the CELP, by consumers being able to scan the product's QR code via smartphones.

Overall, the effective implementation of CEL system involves nine important elements:

1. CEL system and its operating mechanism: this should take into consideration all relevant stakeholders including e-governmental departments, authorised bodies, enterprises, supervision bodies and individual consumers. All the stakeholders play different roles according to the rules of MAEEL and share responsibilities respectively on the basis of cost-benefit optimisation;
2. EES research and development: this is carried out by the NDRC, together with other governmental departments and CNIS, and lays the technical foundation for the CEL system; there is also a need to follow domestic and international trends, especially to update green economic development³³ in China;

³³ Green economy is a kind of new economic form developed with market as the orientation, traditional industrial economy as the foundation, and harmony between economy and environment as the purpose.

3. Specifications for CELP research and development: this regulates what should be included in the label and how to attach the label to products. Different products have different energy efficiency indicators because of the different characteristics of energy use. Therefore, the contents of energy efficiency labels are different according to product categories/ types;
4. CELP catalogue research and publication: the promotion of EES R&D for the new CELP and issuance of new batches of the CELP Catalogue encourages enterprises and consumers to undertake more sustainable production and consumption. Thus, the CELP catalogue can be seen as a bridge towards “green production” and “green consumption”;
5. Administration of the CELP file/input by the enterprises, and documentation record, verification and announcement by ELMC: this contributes to the successful enforcement of CEL;
6. Management of the testing bodies: AQSIIQ authorises the testing institutions for energy efficiency labelling.
7. Promotion of CEL and CELPs: this is very important for the expansion of CEL;
8. Market surveillance and inspection: this comprises complicated and systematic work to formulate a fair CELP competitive market, which is crucial to the CEL successful implementation;
9. Assessment and continuous improvement of the CEL system: this contributes to the improvement of CEL.

These nine elements are interconnected and inseparable. Chart 4 displays the implementation procedures of CEL system.

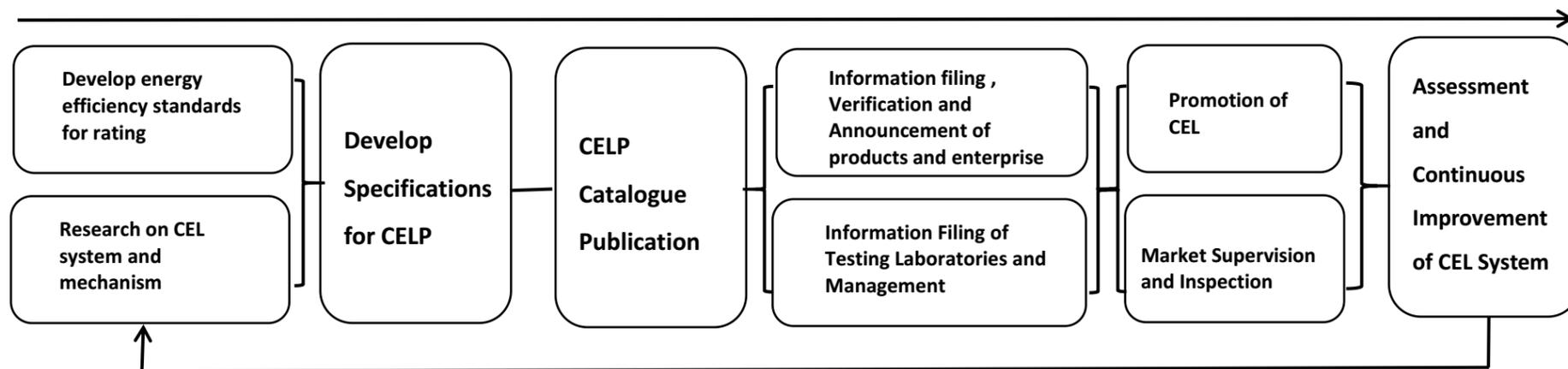


Chart 4 shows the implementation procedures of CEL system.

Chart 4 shows that developing an EES for rating and R & D on the CEL system and mechanism comprises a series of continuous steps for the development of specifications for CELP. When a batch of the EES and specifications for CELP is finished, the NDRC announces the publication of the CELP Catalogue. Enterprises whose products fall within the scope of the list of the CELP Catalogue are required to input information into the China EEL Network (i.e., they must input the product energy efficiency-related information on the information platform).

The ELMC will conduct information verification cooperating with the testing laboratories and documentation records, and then announce the products with the CEL and producers of those products. From the market side, the promotion for the CELP and supervision and inspection of the CELP on the market play key role for the CELP expansion in a fair way. Moreover, assessment is conducted by SAMR, which performs supervision inspection and spot-check inspections, to ensure that the energy-saving performance contributes to the continuous improvement of the CEL system.

5 Analysis

5.1 CEL, Energy Star related to the implementation of the EuP/ErP Directives

This legal basis of the CEL system comprises the following: the Law of Energy Conservation³⁴, together with the Law of Product Quality³⁵, the Regulation Certification and Accreditation³⁶ and the Regulation on Import and Export Commodity Inspection³⁷.

It is claimed that the Chinese governmental departments and the related authorised bodies have attached great importance to all aspects of the implementation of the CEL system, including early and continuous research, implementation and promotion, and the supervision and evaluation. It is claimed that the system of the EES and CELP Catalogue is functioning well. The overall system comprises the research, preparation and publication of the EES and CELP Catalogue. Other (unsubstantiated) claims by Chinese authorities refer to improvements in the “New MAELL” systems of CEL and CELP data file/input and documentation recording, verification and announcement by ELMC, the record-keeping by the testing laboratories, information publicity and consistent compliance and knowledge training, and the market supervision and inspection has been established and is well operating in China.

The CEL system, U.S. Energy Star and European Union (EU) EuP/ErP Directives are all energy-saving policy measures based on current and anticipated technology levels to improve the energy efficiency of energy-using and energy-related products. All of the above systems implement a type of labelling system to show that the relevant products meet the corresponding standards.

EEL systems are conducive to improving consumers' understanding and can effectively influence consumers' purchase decisions and regulate market behaviours. There are indications that CELPs in China are - importantly - also included in governmental purchasing, different to the EU's voluntary Green Public Procurement standards and associated reports.

The Energy Star system (presently dormant between the EU and the USA [status: Sept 2020]) adopts assurance labelling for included energy-using products. However, the CEL by contrast implements a step-by-step strategy for energy-using products via a “batch” approach (which seems to be partly analogous to the periodically-issued Ecodesign and Energy Labelling Working Plan in the EU). According to Chinese sources, the CEL and associated product “batches” are developed according to specific national (Chinese) conditions and demands of green economic development.

In addition, there are differences among the three systems (EU Energy Label/ Ecodesign, Chinese CEL and the US Energy Star) with regard to the energy efficiency targets for specific products. Moreover, due to the differences of geography, history, market and technological development among the three systems, there are some differences in the scope, product classification and test method of the three systems. With the establishment and enforcement of the new MAEEL, China's EES and CEL will aim to improve on an ongoing basis, aiming to continuously retain agility, as has been the experience in the EU and the US. This also includes further expanding the coverage of the EES and the scope of CELPs to add more energy-using and energy-related products into the CELP Catalogue as result of EES R&D.

As a result of gradually increasing the energy efficiency benchmarks of products in the corresponding EES, new EES and updated CEL will be progressively issued. A further claimed step in China to enhance the database for more information disclosure should also be helpful

³⁴ June 1986

³⁵ September 1993

³⁶ September 2003

³⁷ June 1984

in improving the CEL management systems. The CEL-related information platform, with claimed more complete CELP information disclosure, should opening up possibilities for greater public supervision/ transparency/ information provision.

However, compared to the EU and the USA, the foundations and transparency of the Chinese EEL and EES systems remain unclear, since the means by which the CEL levels are negotiated, and how aspects are taken into account, such as purchase price and energy and resource use over the relevant product's lifetime, remain obscure. Whether any included "Circular Economy" aspects (e.g., modular design, repair requirements, and fuller information and disassembly manuals, presence and location of hazardous and/ or valuable substances/ materials for recovery at End-of-Life, etc) are considered remains opaque and unreported, to date.

5.2 Experience from the CEL implementation

The implementation of CEL has many claimed positive contributions to China's energy-saving targets since the 11th FYP. However, it must be noted that there has been no transparent provision of audited and verified information regarding these claims. China also claims that the CEL system has helped in the upgrading of energy-saving and conservation technologies, thus further contributing to China's industrial transformation process.

In addition, China claims that the following experiences have been learnt from the implementation process, to date:

- (1) The CEL-related management system and institutions are still not perfect. The most appropriate restraint mechanism³⁸ to ensure accurate provision of information from enterprises to the ELMC, and to the general public, under the present self-declaration implementation model still needs further research and exploration through the demonstration and pilot projects, in order to avoid so-called "rent behaviour"³⁹.
- (2) The links between China's governmental departments and the other stakeholders are not smoothly connected. More effective implementation, supervision and evaluation measures for CEL still need to put into practice.
- (3) The new MAEEL provides the opportunity for a so-called "market mechanism" to be introduced in the CEL management by the requirement "The NDRC, GAQSI and SASC (have been merged into the SAMR) shall establish the credit records and those who violate the new MAEEL will be recorded and incorporated into the nationally shared credit information platform⁴⁰". However, at present, the market is not mature enough and the market credit system is not yet in place which will be a long-term task.
- (4) The self-declaration implementation model adopted in China is based on the EU approach. But, in fact, most of the Chinese manufacturers - especially the SMEs – do not have the self-discipline and self-organisation that is required by MAEEL. ELMC also undertakes the role of training and capacity building, which has been proven to be very helpful, not only in

³⁸ The term "Restraint mechanism" refers to a functional system for enterprises to accept the guidance of macro-economic policies, and the related claimed improvement to social and economic benefits. It is a mechanism for enterprises to adjust their behaviors to adapt to various conditions.

³⁹ Economic rent is a part of factor income (or price) that is not necessary for the current use of the factor itself and it exceeds what it would have received elsewhere. In short, economic rent equals the difference between factor income and opportunity cost.

⁴⁰ The national credit information sharing platform has collected nearly 500 million pieces of public credit information, including basic information, administrative penalty information, administrative license information and red blacklist information, providing important support for the construction of China's credit system.

relation to the improvement on the manufacturers' social responsibility, but also has proved helpful in increasing consumers' energy efficiency awareness.

- (5) Feedback from all stakeholders is very important for sound CEL management, i.e., including product identification, inspection and testing, supervision and evaluation. Lack of information sharing reduces the effectiveness of the MAEEL. At present, the ELMC information platform aimed at information disclosure and sharing, is not functioning effectively because the technology is limited. The ELMC resource is reported as not yet being "fully developed"; there is lack of an efficient information feedback mechanism, and therefore it is still difficult to complete market surveillance. The information asymmetry of relevant parties leads to a lack of effective market inspection and supervision.
- (6) The corresponding incentive and restraint policies have been proven very helpful to the effective enforcement of MAEEL. These comprise elements such as: schemes to "replace old household appliances with new ones" via offering subsidies; mechanisms to facilitate "consumers' complaints collection and feedback"; "penalties" such as removing non-compliant CELP products from the market, as well as levying of fines; and finally putting non-complaint CELP on an illegal list, etc.. More incentives and restraints may still be required to ensure a fully fair and open market for CELs.
- (7) In section 4.2 - Scope of CELP - we can see that CELP is limited to 5 product groups. There has not yet been a complete EES standard system established for all products. China should gradually develop the EES system framework to cover all products.

5.3 Room for CEL improvement

- (1) According to the 13th Five-Year Plan of Economic and Social Development, the energy conservation standard system should be further improved for green economy and green development. On 4th April 2015, the Opinion of the General Office of the State Council on Strengthening Standardization of Energy Conservation was issued, which aimed to further improve the standard system, and the implementation and inspection system of energy conservation. The EES - together with the energy conservation standards - will cover the key industrial sectors and energy-using equipment, and also the implementation and inspection system of the energy conservation will work together with the CEL implementation and inspection system shall be integrated into an innovative mechanism.

On 17th December 2015, the Development Plan for National Standardization System (2016-2020) was issued by the General Office of the SC. In this plan, the following three key points related to the CEL improvements were put forward: a) establishment of a monitoring and evaluation system for standards implementation and enhanced supervision by society, b) deepen international collaboration, and c) improve energy conservation standards and speed up the development of EESs.⁴¹ Importantly in the context of this research, China will need to explore how to integrate the "Top Runner" indicators into the EES mandatory standard system, as well as how to set an advanced EES to lead the transfer of green production and consumption.

⁴¹ For instance, some acceleration of EES is planned to happen with The "Decision of the State Council on Strengthening Energy Conservation Work" requires the formulation and improvement of energy efficiency standards for industrial energy-consuming equipment, motor vehicles, buildings, household appliances, and lighting products, and the expansion of the application of energy efficiency labels on household appliances, motors, automobiles and buildings. The "Medium and Long-term Special Plan for Energy Conservation" clearly states that the focus of commercial and civil energy conservation is to improve the energy efficiency of energy-consuming equipment, implement energy efficiency labels, and formulate and implement mandatory regulations for major industrial energy-consuming equipment, household appliances, office equipment, lighting appliances, and motor vehicles. Advanced energy efficiency standards.

- (2) Improving and enhancing database of the EES and CELPs: the EU's self-declaration is implemented on the foundation of information management and disclosure. From the EU experience, the construction of the network database and platform should be further developed, via collecting data on the energy efficiency index of products from professional testing laboratories and enterprises. The ELMC should continue to record the data in the EES and CELP database and continually update this data resource, in order for consumers and other stakeholders to gain access to accurate information and knowledge on EES and CELP by scanning the QR Code. This would then enable businesses, stakeholders and consumers to evaluate the energy performance of the corresponding products and to give feedback on their opinions to the ELMC and the governmental departments, including to the local DRCs and AMRs, as well as to manufacturers/enterprises. The transparency of law enforcement and the convenience of information access need to be effectively enhanced by the market supervision on the CELPs and the trust and recognition of this by consumers.
- (3) Capacity building on the effective implementation of the CEL system: As mentioned above, at present, the CEL system is still facing problems, such as low energy efficiency allowable values, the revision cycles for the EES, and the issue that the scope of CELPs does not yet cover all the energy-consuming products with a high energy-saving potential. Also, the management system lacks an effective market-based method and the enterprises' participation in the EES R&D is limited. According to the current situation of energy-saving technology development and the demand for a green economy and green development in China, there needs to be capacity building to improve the CEL system, and to update the corresponding EES, to ensure that the CEL system maintains a strong adaptability and remains forward-looking. At the same time, there is a need to:
- a) strengthen international exchanges and cooperation in relation to EES and EEL to permit mutually learning regarding advanced concepts and technological progress.
 - b) develop a mutual recognition of EEL systems with other countries,
 - c) build capacity of enterprises to enable them to introduce advanced technology and new materials, adjust product designs, and to ensure that product energy efficiency indicators meet the higher requirements of progressive and ambitious energy efficiency aims, as consumers' knowledge increases to enable greener consumption.
- (4) Establishment of a complete market surveillance mechanism: Based on the existing mechanisms of complaints, notification, correction within the limited time and punishment, stricter penalties such as prohibition of sales, revocation of production licenses, suspension of production and rectification or revocation of licenses, which will result in the increasing cost of violations, and should be added in the future revised version of MAEEL. The new MAEEL has added the requirements that the CELPs sold in the online stores must comply with MAEEL, but the surveillance of the e-store sales of CELPs should also be further explored. In addition, feedback from stakeholders about the CELP energy-saving performance is limited but is very important for the ELMC to conduct the information verification of CELPs. The mutual supervision/ cooperation among the manufacturers should be taken into consideration for the revision of MAEEL, or the relevant detailed management rules. Moreover, the incentive and promotion mechanism of CELPs, together with the renewal mechanism of linking up energy efficiency "Top Runner" indicators with the compulsory national standards, should also be established. There were 150 products listed in the energy efficiency "Top Runner" catalogue in 2016, which fall into the three types of products e.g. household refrigerators, flat panel TVs and air conditioners made by the 18 participating enterprises (to date), including Haier, Skyworth and Green Electrical Appliances.

- (5) Establishment of a basic energy-saving management standards system: in order to provide technical support for energy-saving management systems, and to provide the technical support for the implementation of CEL, there is a need for a greater focus on online energy monitoring, energy performance evaluation, energy contract management, energy conservation and energy-saving technology evaluation, energy management and audit, energy-saving supervision, etc.
- (6) EPR (Extended Producer Responsibility) and the implementation of CEL - from the enterprise side, EPR can link with CEL, via ecodesign and the enforcement of EPR in China. EPR pilot enterprises initiatives have been launched by MIIT, and hence the cooperation between MIIT and government departments involved with CEL will be crucial to the successful combination of the EPR pilot and CEL system. Enterprises will need to be encouraged to invest in R&D related to higher energy efficiency products, using product-related environmental evaluation tools such as Life Cycle Assessment (LCA). According to the requirements of CEL, the gap between product and standard requirements need to be investigated and closed, possibly requiring the introduction of advanced technologies, new materials and product design schemes into the consideration of EES R&D/ standard-setting and ambition levels. In addition, enterprises should actively participate in the formulation of the EPR and CEL-related national standards, because these standards are constantly improving in order to adjust in a timely manner the objectives of technological innovation, and to take advantage of market opportunities. Developing a culture of self-regulation, including establishing a laboratory with high-level testing ability and quality management system, is an important part of each relevant enterprise's ecodesign, energy efficiency labelling and recycling systems.
- (7) Finally, and fundamentally, due to the government's stated mission to develop a unified Green Product (GP) system (within the main responsibility of the General Office of the State Council (SC), the AQSIQ and SAC), it is still uncertain whether the CEL system will be incorporated into the GP system, and if so, when this might occur, and how it will be accomplished.

6 Open questions

The work related to Contract 2018/402135 for the European External Action Service, as technically supervised by the European Commission (primarily DG GROW) in Brussels, took place between March 2019 and December 2020.

During this time, good cooperation was achieved between the appointed External Experts (Prof Martin Charter, Dr Frank O'Connor, Prof Jin Min and Zhang Enrui) and China's Ministry of Industry and Information Technology, the EEAS Representation in Beijing, CEN-CENELEC (particularly via its links with DG GROW and CESIP, the Europe-China Standardization Information Platform), as well as industry stakeholders in Europe and in China, and EU environmental and consumer NGOs.

However, there remain a number of open questions resulting from this research, where a definitive understanding of certain topics was not fully achieved. The fact that these questions remain open, despite the systematic and intensive efforts of the research team, as well as the EU's financial and technical investment, perhaps indicates the limits of an approach where a culture of reticence or the lack of strong commitment in advancing mutual cooperation and engagement from the stakeholders concerned forms an inhibitor to achieving results. Further research and possible on-the-ground fieldwork in China may shed more light on these topics. Research areas are identified below, based on the sections referred to in the report on China Energy Labelling Product policies.

6.1 Section 2

- In section 2.2 the **legal basis of CEL** is explored. It was noticed also that other researches pointed out that the legal framework represent a barrier together with lack of stakeholders' engagement. In this regard, what is the process by which the detailed requirements are arrived at? I.e., how is the level of ambition ascertained, and by whom? What 'checks and balances' are there in the system? How transparent is it? Who is consulted? To what extent stakeholders are engaged? It seems a lot is kept in house within government while high level professors and then companies are 'invited in' in some form some experts are invited showing some level of engagement exists but in a different way compared to other countries.
- Regarding the **MAEEL** (sec.2.2), further research is needed to understand the process by which the detailed requirements for its implementation are arrived at? For instance, how is the level of ambition ascertained, and by whom? What 'checks and balances' are there in the system? How transparent is it? Who is consulted? What role do stakeholders have, including NGOs?
- Further research is needed to understand the CEL Credit System that the AELE is at developing. And who is eligible to receive these "credits". Manufacturers, or purchasers? Does it refer to Green Public Procurement? However, is it State Aid in disguise? According to our understanding it seems this system to draw from the Carbon Credit one foreseen in the Kyoto protocol where not only "negative credits" are given to polluters but also some form of incentives might be foreseen for instance by buying energy efficient products from some form of accredited stores. To date any written evidences has been found during this project about the credit system.
- In paragraphs 2.4 the **CEL system** has been explored and its high level of complexity emerged. To better understand it, a closer analysis is needed to show who develops the laws, who votes on them, who supervises them, and who carries out checks and supervisions and ultimately any "criminal" enforcement, if this happens. In addition, it should also be detailed what is the hierarchy of importance of each of the "players", as well as the presence of competing bodies. To better understand the working framework, greater explanation and detail should be given to discern to what level analogies might be

made between the Catalogue of Products and the EU's Ecodesign and Energy Labelling Working Plan. According to our China-based expert, the Catalogue could be defined as a plan lasting several years in which the products due to have possible measures are identified; however, what are the selection criteria for product groups' inclusion in the Catalogue, and how is this assessed in practice? (I.e., a close analysis is needed, to compare the study steps with the preparatory stages of the EU's Ecodesign and Energy Labelling Working Plan, every c. 4 years). How are priority product identified? Is the Catalogue the resulting list of products, once Chinese legislation exists to govern them from a CEL/ EES list of requirements? Although we found some literature attempting to explain the level systems, more clarity is also needed re. Labelling System of 1-3, and 1-5. Are both still running, or only now 1-3 labels? Are there other reasons for products to be subject to a Labelling System of 1-3, or 1-5 (if both systems are still in force)? Clarity is also needed to disentangle the relationship with Chinese GPP and "reach" level of labels, eventually.

6.2 Section 3

The third section looked into the Energy Efficiency Standards.

- Some other aspects to be further investigated are related to the **process to derive label values and ambition levels** explaining the actors involved, their roles and tasks, possible consultations as well as timetables of implementation. If this is similar to the EU system for Ecodesign (ED) and Energy Labelling (EL), the EL market data and sales information, as well as preponderance of certain performance levels, are discerned from the ED information initially, and then built on to provide the present basis for understanding the EL situation. Further, these data are used to estimate what could be the future ED minimum levels to set, and the levels of ambition over time (including future-oriented reviews) for both the ED minimum levels and the EL label-specific performance bandwidths and band levels (i.e., the EU's A to G, green to red labelling system).
- There seems to be a **similarity between what is defined by the Chinese as a "limited" value and the "Ecodesign-style" concept** of a mandatory minimum threshold performance value (MEPS). It is understood that the "standard system of resource conservation and comprehensive utilisation" should contain the minimum threshold, i.e., mandatory minimum standards/ levels of performance, as well as the standards that must be met. However, all the above needs to be fully cross-checked and understood.
- The scope of the research, from technological and market coverage/ penetration perspectives, needs to be clarified for the **Chinese 'ED' and 'EL' systems**. Is the research and checking performed globally or solely within China, regarding leading energy efficiency indexes for devices? For instance, it is reported by the China –based expert in the report that the design of China's energy efficiency "Top Runner" system was compiled via cross-referencing Chinese national conditions but using as its basis the design and implementation experience of the "Top Runner" system in Japan. Since the Japanese "Top Runner System" was taken as a reference, it would be very useful to have details comparing the Chinese and Japanese "Top Runner" schemes, as well as comparing these with the EU's Energy Labelling system, GPP and Ecolabel schemes. In the Chinese scheme, the list is determined according to the enterprise declaration, local recommendation, initial evaluation, on-site energy efficiency testing, second evaluation and publicity.
- In section 3.2, several **terms and concepts** are listed. Among them, the "target" energy efficiency indicator is particularly relevant, as it seems to be the core performance measure, and compulsory market-access indicator. It sounds like the EU's Ecodesign minimum threshold (MEPS) approach. Also the energy efficiency grades sound like the Energy Label (EU style). The three / five years period after the EES is enforced could be seen as the "Tier 1" and "Tier 2" requirements in EU Ecodesign. For a better and clearer

understanding, development of a comparative table is highly recommended, based on real implementation of several actual product groups (in both the EU and in China). In addition, for future research, it would be extremely useful to carry out several case studies on the development of how the draft measures for each product group studies were analysed, discussed and reached, and a description of the stages to reach final publication and implementation of the required performance levels. This should be taken all the way to uncovering who was involved, how transparent was the process, were Chinese trade associations and environmental/ consumer NGOs involved, were foreign trade associations, academia or individual companies able to participate in discussions, or at the very least able to obtain information about the draft measures being considered? How was the content, the ambition, the design and the aims of the associated labels decided upon, technically and graphically, and was it more with regard to the “state-of-play”, or rather if the measure was being designed to encourage manufacturers and potential purchasers to aim for more ambitious levels?

- Section 3.3 explored the **characteristics and functions of the EES**. Looking at its main features, a cost-benefit approach is used to set the targeted levels of energy efficiency. There might be a similarity with the EU’s “Least Life Cycle Cost” approach, but this is not obvious at all from the information obtained to date from the China-based expert. These aspects require future research, focusing on explaining the main steps mentioned in the section, and a full grasp of the processes and procedures followed in China. A qualitative review and reflection on the degree to which the process is transparently undertaken would also be extremely useful.

6.3 Section 4

This section explores the **evolution of the CEL and the MAEEL from 2015 onwards**.

- Via the exploration presented regarding the **new CEL with QR code** (sec. 4.1), it is understood that a sampling check is performed. It would be useful to obtain more data on this process to understand what this check implies, as well as the way it is carried out, and the actors involved. Since this sample check is used to score the product and its CEL, the degree of transparency and its reliability needs to be proven.
- In Section 4.1, it is explained that **manufacturers and importers who use their own laboratories for testing are responsible for the testing results**, but it was not possible to detail the legal responsibilities they bear and if they differ by company and with regard to third-party test houses. Hence future studies should focus on this element, as well as on the study of the permitted third-party testing houses (typology, location etc.)
- Satisfactory and transparent **market surveillance** is an issue that needs to be pinned down, throughout, as well as how “regional variations” are ironed out, if at all (e.g., whether there is any data exchange and comparability systems between provinces, as is performed in some EU countries and within countries, comparing regions).
- A **credit system** is mentioned again in section 4.1, but there is very little data that has been collected on the way that such a system works in China. Therefore, it is very important to explain what these “credit records” are, and how the credit system functions. Does “Credit record” refer to the credit rating agency’s description of the credit status of economic subjects, expressed with certain symbols or words? How is the evaluation/provision of credits performed, and on what is it based, e.g., is it underpinned by certain standards and indicators? How transparent is the system, and how is it audited?
- Section 4.2 explores the **CEL Product batches published in the catalogue**. Batches also include updates and modified specifications on specific type of products. These modifications look like the “Reviews” of Ecodesign and Energy Labelling regulations, occurring every 3-4 years (typically) in the EU system. It would be relevant for further research to explore and to cross-check whether this similarity holds. It would also be

crucial to understand how the “modification”/ updating process is conducted in China, which stakeholders may be involved, as well as if the discussion (forum, if one exists) is performed openly, in particular if industrial and NGO stakeholders are allowed to take an active part in it, by reviewing draft proposals, up until the final version.

- Regarding **development of new batches** (Sec. 4.2) of EEs for CELP, a clearer understanding of the process is needed, and whether there is a consultation with Chinese ministries other than the MIIT.
- Looking at the **Catalogue of CELP**, there could be an analogy with the Ecodesign and Energy Labelling Working Plan in the EU - this should be explored by further studies.
- Concerning **Market surveillance** mentioned at bullet 8 in section 4.4, it is necessary to clarify how it is achieved, and what needs to be improved in the present system. Special emphasis in any future studies should be placed on the level of difficulty for a non-Chinese manufacturer/ importer to get through the market surveillance system, successfully, e.g., what is the timeline for approving a product? Also, how much notice of potential and actual future requirements is given openly too importers into the Chinese market?
- Chart 4 shows the **implementation procedures of CEL System**. Further analyses should explain how this process works, by detailing how each step/ box is conducted and who is involved.

6.4 Section 5

- The first paragraph of Section 5 summarises the **CEL System** described in the report. However, it was not possible to clarify what are the steps in the process of setting minimum standards, what work is conducted to underpin the proposals (preparation, market, technology, LCA etc), and how are they checked with stakeholders to ensure that the proposals are viable, that the designs described and postulated for the future are representative, and are “correctly” costed, and have the feasible level of ambition and implementation timetable.
- The fact that **CELPs** are included in governmental purchasing shows that there is some relationship to green public procurement, which seems to make use of the CELP per se, or to take the CELP ratings into account in some way. It is necessary to understand how this works in practice.
- Regarding the **CELP scope** (Bullet 7 sec. 5.2), it should be clarified if the current framework is ready to be applied to “all future products”. If so, whether the actual implementation per se depends mostly on matters related to time and resources, and/or the process of choosing which products to address.
- Due to the sensitiveness and the strategic importance of this topic, it has not been possible to get an authorisation to access an **English copy of some key documents**, such as the current and new MAEEL, and the new MAEEL, or at least summary versions of both, with the key features and requirements, as well as details of the energy efficiency “Top Runner” scheme. For future work, it would be very useful to get a clear picture of the bases of these elements. Also, a group of 18 enterprises is mentioned (Sec. 5.3 bullet 4). It would be strategically useful to obtain the full updated list, and to understand to what extent the “Top Runner” catalogue is open to non-Chinese enterprises, as well as who and how this is decided upon?
- It is reported that the **establishment of a more efficient energy saving management standard system** needs to be organised online through web interfaces. However, it was not reported on how this is proposed to be undertaken, or whether it concerns online use of products in real time, for instance via “smart meters”, or whether the reported elements

refer to solely online sales of the products concerned when first purchased. Future research work should go deeper in studying these aspects.

- In view of developing a **self-regulation culture**, it is argued in the report that the ecodesign of products can play a role to link EPR and CEL from the enterprise side, and that this requires intra- governmental cooperation to encourage companies to invest in R&D, as well as to obtain the involvement of companies in the formulation of both EPR and CEL standards (Sec. 5.3 Bullet 6). However, the link between EPR and CEL still needs to be explored, and some questions are still open on this. For instance, are EPR pilots initiatives in enterprises conducted before full implementation? Will there be a requirement from ecodesign with Chinese EPR? What is the product coverage? How do China EPR differ from the WEEE directive? EPR development seems to be MIIT's responsibility; as such, does the ministry have this role only in relation to the "EPR"/ End of Life/ repairability aspects? What are the roles of the various ministries and agencies involved? Are the delineations of responsibilities clear and unambiguous? Are transparent records available regarding the results obtained, as is done in the EU via the Ecodesign Impact Accounting framework, which is audited by external expert consultants, and compiled at frequent intervals? Future studies should take these matters into account in designing their research questions.
- The report argues that **the CEL system would probably be incorporated into China's ongoing GP system** (Sec.5.3 bullet 6). Given the roles of the different product regulation systems, and the roles of the different ministries and agencies in China involved, it would be extremely useful for future studies to look closely at this process, to try to understand how it functions, or is planned to function. Results from the CEL/ GP combined system, if possible to establish, would be extremely useful to obtain and to understand, to see if similar ideas might be applied in the EU. This would be especially important where there have been success stories in China (or, on the contrary, also to avoid pitfalls in the EU, where these were experienced in China).