ENSURING COMPLIANCE WITH MEPS AND ENERGY LABELS

United Nations Environment Programme – United for Efficiency (U4E)

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_____

Hao Wu, UN Environment Programme, Economy Division
Paul Kellett, UN Environment Programme, Economy Division
Patrick Blake, UN Environment Programme, Economy Division
Irene Fagotto, UN Environment Programme, Economy Division
Moira Mathers, UN Environment Programme, Economy Division

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For more information, contact:

United Nations Environment Programme –
United for Efficiency initiative
Economy Division
Energy, Climate, and Technology Branch 1 Rue Miollis, Building VII,
75015, Paris FRANCE
Tel: +33 (0)1 44 37 14 50
Fax: +33 (0)1 44 37 14 74
E-mail: u4e@un.org
http://united4efficiency.org/

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Acronyms

AEC	Annual energy consumption
APF	Annual performance factor (for air conditioners)
BAT	Best available technology
CAB	Conformity assessment body
CAR	Conformity assessment report
CB	Certification body
COP	Coefficient of performance (for air conditioners)
CSPF	Cooling seasonal performance factor (for air conditioners)
DoC	Declaration of conformity
EEI	Energy efficiency index
EER	Energy efficiency ratio (for air conditioners)
GHG	Greenhouse gas
GWP	Global warming potential
HFC	Hydrofluorocarbon
HCFC	Hydrochlorofluorocarbon
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
kWh	Kilowatt-hour
LCC	Life cycle cost
MEPS	Minimum energy performance standard
MSA	Market surveillance authority
ODP	Ozone depletion potential
OEM	Original equipment manufacturer
PRS	Product registration system
SCOP	Seasonal coefficient of performance (for air conditioners)
SEER	Seasonal energy efficiency ratio (for air conditioners)
U4E	United for Efficiency
Wh	Watt-hour

1. Introduction

This guidance on ensuring compliance with minimum energy performance standards (MEPS) and energy labels complements other UNEP U4E Guides on market transformation.[1] It is applicable for suppliers (e.g. manufacturers, their representatives, or importers)[2] and officials to foster proper compliance. While the content is focused on refrigerating appliances and air conditioners, it is also broadly applicable to other products.

MEPS and energy labels, if well-designed and implemented, are some of the fastest and most effective approaches to transition markets toward more energy-efficient products. At least 127 countries have adopted, or are in the process of adopting, MEPS to phase out inefficient products from their markets, and energy labels to indicate the energy efficiency of new products to prospective purchasers. Experience shows that the schemes that stimulate the greatest shift towards higher efficiency products are those which follow good practice with compliance. Inadequate MEPS and labelling requirements and enforcement leave countries vulnerable as dumping grounds for products that cannot be sold elsewhere.

Each country has unique characteristics. This guidance is intended as a starting point to facilitate the compliance process. The steps should be undertaken transparently and with sufficient time to address local circumstances (e.g. availability and prices of products, income levels, utility tariffs, etc.). Countries committed to market transformation and prepared to invest in the needed market and impact assessments, stakeholder consultations, monitoring, verification, enforcement, awareness raising, and beyond should strongly consider mandatory MEPS and labels.

Neighbouring countries should align or collaborate, where practicable, to reduce complexity and compliance costs for manufacturers, and the challenges of oversight and enforcement for officials. This can entail the use of cooperative arrangements, such as mutual recognition agreements on conformity assessment and verification testing results. Consistent approaches across countries help yield economies of scale for efficient products that save consumers' money on electricity bills, reduce air pollution, mitigate greenhouse gas emissions, and enable greater electrical grid stability.

Section 2 describes how to conduct conformity assessments, including specification of requirements, declarations, certification, use of product registration systems, maintenance of records as well as international alignment. Section 3 focuses on market surveillance management and responsibilities. Various methods to enhance enforcement are presented in Section 4.

[1] UNEP U4E (2021) *Energy Labelling Guidance for Lighting and Appliances*, and *Protocols To Conduct Market And Impact Assessments*, both available at: https://united4efficiency.org/resources/publications/

[2] Supplier refers to any natural or legal person who places products on the market and/or puts them into service, and who has legal responsibility for their conformity with regulatory requirements, such as MEPS and labels, specified in local law. It can include: manufacturers; their 'authorised representative' (which means any natural or legal person who has received a written mandate from the manufacturer to perform on their behalf all or part of the obligations and formalities' connected with respect of local regulations); or importers who place a product from a third country on the local market.

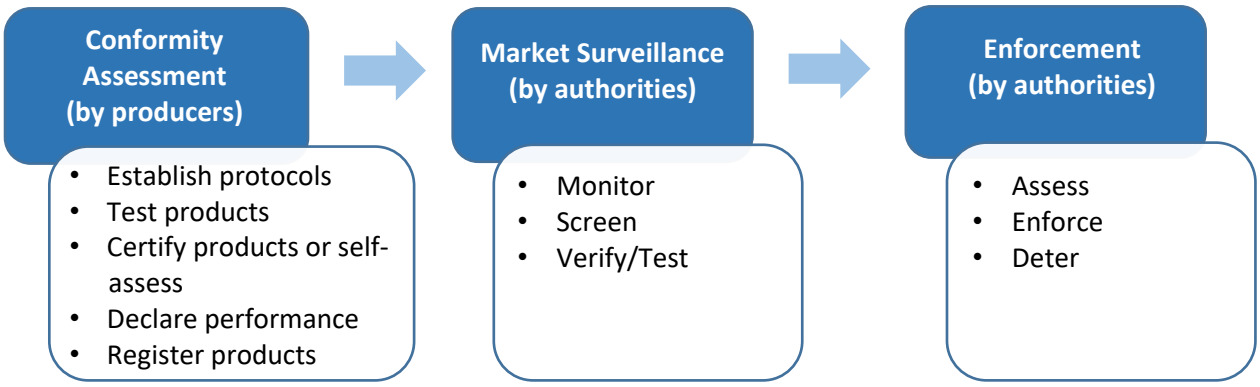
1.1 Overview of compliance

MEPS and labels are critically important in driving market transformation, but they are only useful if products are compliant with energy efficiency limits and the energy labels correctly reflect the performance of the products. Even mature MEPS and labelling programmes can experience problems with compliance, and this can occur even for products that have been regulated for many years. It is therefore essential to design and implement robust compliance regimes.

Compliance frameworks aim to ensure that suppliers follow necessary steps so that their products comply with requirements and are correctly labelled prior to their placement on the market. These frameworks also help policymakers to monitor and verify that products conform over time and to take corrective action to deter non-compliance. These actions are essential if the desired energy, economic and environmental benefits are to be achieved, while ensuring a free and fair market for legitimate suppliers.

The three main pillars for a high level of compliance are: **conformity assessment**, **market surveillance,** and **enforcement** (See Figure 1). All three are necessary. The main body of this report discusses these aspects and includes guidance on effective implementation. Some actions that support market surveillance are synergistic to those for market assessments and feed into impact evaluations.[3] Efforts can be shared across these activities.

Figure 1: The pillars of compliance



[3] UNEP U4E (2021), *Protocols to Conduct Market and Impact Assessments*, available at: https://united4efficiency.org/resources/publications/

Case study: ATLETE and EEpliant verification testing of refrigerators in the European Union (EU)

Energy labelling for refrigerators began in 1995 in the EU. Between 2009 and 2011, the EU-funded ATLETE project conducted verification testing on 80 refrigerator models sampled from across the EU. Often, market surveillance authorities (MSAs) target products perceived to be less likely to comply. ATLETE aimed at understanding overall compliance, so semi-random sampling was used targeting 50 per cent of the highest selling products and 50 per cent chosen at random. For each refrigerator model, verification tests were conducted on the following technical parameters:

Parameter	Description
Energy consumption	Energy consumed over 24 hours
Storage temperature and climate class	Ability to simultaneously maintain required storage temperatures in different compartments at a certain ambient temperature
Storage volume	Space, expressed in litres, to store food
Freezing capacity	Amount of food, expressed in kilograms, that can be frozen to a core temperature of -18°C in 24 hours
Temperature rise time	Time needed to raise the temperature of food in the frozen food compartment from -18°C to -9°C after its operation has been interrupted

Compliance with any one of these parameters was between 70 and 90 percent. Only 43 per cent of appliances correctly declared ratings for all parameters. For the energy label, 80 per cent correctly declared the energy efficiency class, 14 per cent were overrated by one class, and 6 per cent were overrated by two or more classes. ATLETE showed that even for products subject to regulatory requirements for many years, non-compliance can be prevalent. Although this was not full verification testing or enforceable (since three additional units were not tested after a single failed test), ATLETE did lead to calls to strengthen market surveillance. The EEpliant project that replaced ATLETE is in its third phase, involving 24 MSAs and more in-depth testing.

Sources: ATLETE study (2011) http://www.atlete.eu/; Accessed on 26 November 2020.
EEPliant3 (2018) https://eepliant.eu. Accessed on 26 November 2020.

2. Conformity Assessment

2.1 What is conformity assessment?

A conformity assessment includes steps by suppliers and officials to ensure that products adhere to MEPS and labelling requirements before being placed on the market. It includes testing to determine performance, a declaration of performance, and documenting the assessment. It may be subject to inspection and recording through a product registration process (See Section 2.5), market surveillance (See Section 3) and enforcement (See Section 4) to ensure that the conformity assessment is carried out correctly. Parts of the assessment may be performed by third party laboratories and by certification bodies. A clear and actionable conformity assessment procedure includes instructions to suppliers. If the requirements are unclear or impractical, there is an elevated risk of non-compliance and missing documentation, even when market actors aim to abide by the law.

2.2 Specification of requirements

Conformity assessment procedures need to be specified for each regulated product and should be included in applicable legislation. These procedures are drafted and adopted by the regulators responsible for MEPS and energy labelling. The procedure lists the steps that a supplier must follow to ensure that a product that they wish to place on the market complies with all legislative requirements. The aim is to secure the confidence of consumers and public authorities in the conformity of regulated products, allow fair competition between manufacturers in the conformity of regulated products, and ultimately ensure that the environmental objectives are met.

Typically, to avoid confusion and to simplify conformity verification, only one compliance pathway is permitted. Some jurisdictions, notably the EU, allow more than one pathway. An example of the EU conformity assessment protocol is given in Annex A. Key distinctions between conformity assessment options are the degree of independence and the required technical competence of the party responsible for conducting the assessment. Regulators need to weigh the pros and cons to decide on a viable approach. Table 1 outlines typical options.

Table 1: Conformity assessment options

Self-declaration by the supplier (first-party)	In-house accredited assessment body – part of the supplier's organisation (second-party)	Independent external assessment body[4] (third-party)
Supplier carries out all required controls and checks, establishes the technical documentation, ensures the conformity of the production process, and takes the risk if anything is found to be incorrect.	The body demonstrates the same technical competence and impartiality as external bodies through its accreditation. It should not undertake activities other than conformity assessment, and be independent from commercial, design and production activities.[5]	Regulators may either designate a specific laboratory or laboratories to be used or specify eligibility criteria e.g. that they are accredited and independent from the supplier.
Pros: • Less risk of delay and costs for a product to be on the market. • Unscrupulous importers may have less incentive to attempt to bypass controls as compliance is less onerous.	**Pros:** • The competence of the conformity assessment is assured.	**Pros:** • The competence of the conformity assessment is assured. • Separates the interests of the assessment outcome from those of the assessor, which reduces the risk of a false performance declaration.

[4] There are different types of conformity assessment bodies (CABs) that can undertake conformity assessment. They can come in any organisational form (government agencies, national standards bodies, trade associations, consumer organisations, private or public companies, or non-profits). See https://www.iso.org/sites/cascoregulators/01_3_conformity-assessment-bodies.html

[5] European Union (2008), *EU Decision No 768/2008/EC*, Article R21, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008D0768

Self-declaration by the supplier (first-party)	In-house accredited assessment body – part of the supplier's organisation (second-party)	Independent external assessment body[4] (third-party)
		Pros continued: • Possible commercial benefit (greater market acceptance and reduced risk of products held up for verification checks by MSAs)
Cons: • Not independent and potentially not fully standardised, unless specific measurement standards and documentation are mandated. • Easier to cheat unless supported by robust market surveillance.	**Cons:** • Impartiality is not ensured. • Many suppliers do not operate such bodies, so it can only be one of a set of permitted options.	**Cons:** • May be more expensive and time consuming for the supplier • Insufficient capacity of verification bodies can jeopardise market transition. • Continuous verification of products placed on the market is needed to ensure ongoing compliance.
Examples: The most common approach - used by EU, Japan, India (in accredited labs only), Australia and many others.	**Examples:** A permitted option in the EU and in India, where manufacturer test labs used for self-declaration must be accredited by the national accreditation body.	**Examples:** • See EU and North America conformity assessment case study. In practice, not widely used in the EU for energy labels and MEPS. • See Tunisia case study. • Used in Nigeria but assessment can be carried out in approved international accredited laboratories.

Accreditation is an official recognition by an approved accreditation body that a testing laboratory has the competence and procedures in place necessary to conduct the required tests. It is carried out by national accreditation bodies that are generally members of the International Laboratory Accreditation Cooperation (ILAC)[6] and the International Accreditation Forum.[7] The Committee on conformity assessment of the International Organization for Standardization (ISO) publishes widely acknowledged standards on conformity assessment, assessment bodies and accreditation.[8]

[6] ILAC is the international organisation for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies including calibration laboratories (using ISO/IEC 17025), testing laboratories (using ISO/IEC 17025), medical testing laboratories (using ISO 15189), inspection bodies (using ISO/IEC 17020) and proficiency testing providers using ISO/IEC 17043.

[7] The IAF is the world association of Conformity Assessment Accreditation Bodies and other bodies interested in conformity assessment in the fields of management systems, products, services, personnel and other similar programmes of conformity assessment. Its primary function is to develop a single worldwide program of conformity assessment which reduces risk for business and its customers by assuring them that accredited certificates may be relied upon. Accreditation assures users of the competence and impartiality of the body accredited.

[8] Standards by ISO/CASCO Committee on conformity assessment, https://www.iso.org/committee/54998/x/catalogue/p/1/u/0/w/0/d/0. Accessed on 26 November 2020.

The limited comparative evidence on the effectiveness of the different conformity assessment options from long-established MEPS and energy labelling programmes suggests that despite the choice of conformity assessment, compliance is equally likely to be influenced by other factors such as the strength of market surveillance and enforcement applied (discussed in Sections 3 and 4 respectively). Economies that permit self-declaration may still achieve high compliance if these other aspects are well-managed to compensate for suppliers' freedom during conformity assessment.

Case study: Conformity Assessment Process in Tunisia

Tunisia established MEPS and labelling for refrigerators and then other products starting in 2003. Although largely aligned with EU regulations, the conformity assessment practice adopted here is different. Under the Tunisian system, suppliers are required to inform the authorities that they wish to place products for sale and send samples for testing at the government-authorized test laboratory, CETIME. CETIME conducts conformity assessment tests and informs the supplier of the results, which the supplier must report in their product's technical documentation and energy labels. Suppliers are responsible for printing the labels. The documentation, test results and energy labels are sent to the state energy agency, ANER, to verify against the data received from CETIME. If all aspects are in conformity, the supplier is authorized to place their products on the market.

Prior to establishing CETIME as the sole authorized laboratory for conformity assessment and verification testing, the authorities ensured the laboratory was accredited to carry out product-specific energy performance tests to ISO standard ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration of Laboratories. They hired a renowned international laboratory to ensure all aspects of CETIME's laboratory, staff training, and procedures were in line with best practices, verified through round robin testing, whereby the same product sample is tested in different laboratories and the variance is compared to determine if they are in an acceptable range.

Source: original research

Case study: EU and North America Conformity Assessment

In a market survey by the International Federation of Inspection Agencies (IFIA) and the International Confederation of Inspection and Certification Organizations (CEOC) from 2014-2016, 537 samples of products from eight different categories of small household electrical appliances were selected and tested by an independent laboratory for conformity to safety standards. Of these, 316 were purchased in the EU and 231 were purchased in North America. The study compared regulatory compliance of self-declared products, which represent approximately 90 per cent and 5 per cent of products in the EU and North America respectively, with the compliance rates of products certified by third parties.

The study found that 17 per cent of the products with self-declarations were non-compliant, demonstrating dangerous safety faults, while only 1 per cent of third-party certified products failed. While the small sample size precludes a firm conclusion, it suggests that third-party conformity assessment boosts compliance.

Sources: Originally from IFIA & CEOC (2018), reported in ASIA EDGE (2020) *Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States*, prepared by CLASP with support from the US Department of State for the ASIA EDGE initiative. (Note: IFIA and CEOC merged in 2018 to form the "TIC Council")

2.3 Conformity and performance declarations

As part of conformity assessment, the manufacturer, or its authorised representative, must draw up a conformity assessment report (CAR) – also sometimes referred to as a declaration of conformity (DoC). It is very important that MEPS and labelling regulations [9] specify who is responsible for producing the CAR[10]. The CAR should contain all information to identify:

- The product.
- The legislation according to which the product is issued.
- The manufacturer or their authorised representative.
- The conformity assessment body used, if applicable.
- Reference pertinent measurement standards or other normative documents, where appropriate.

The CAR is the legal instrument to show that a manufacturer, or their representative, acknowledges responsibility for the claimed performance. This acknowledgement is important if a compliance authority wishes to confiscate products or take legal action for non-compliance. Supporting technical documentation, including declared performance information and supporting test reports, are also necessary, as described in Section 3.3.1. These may subsequently be requested by authorities before a product is placed on the market and afterwards for verification.

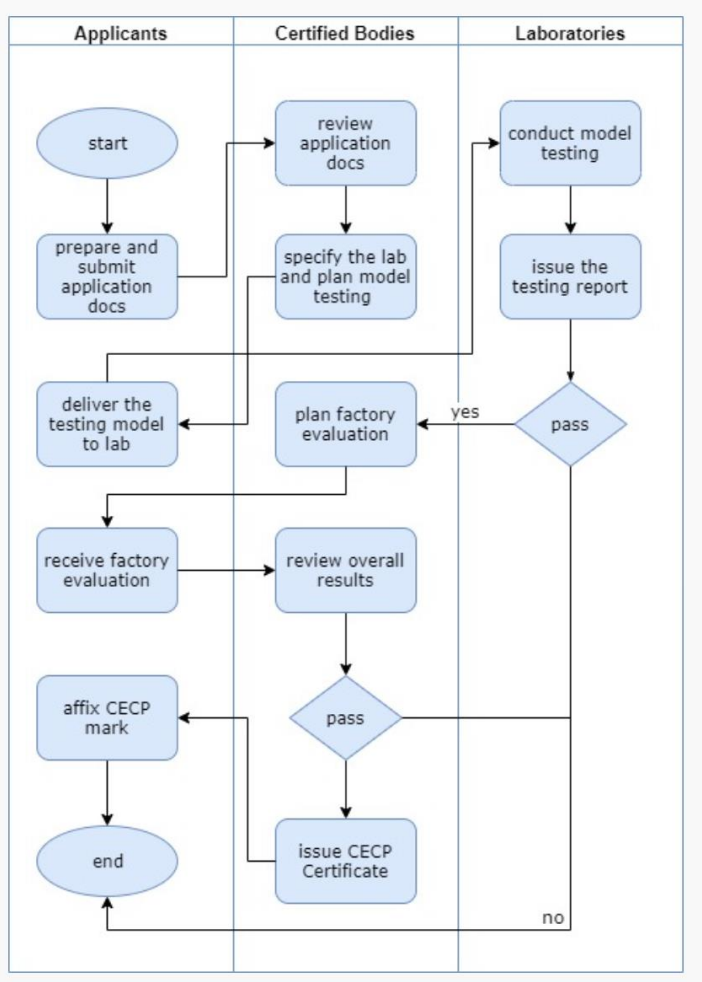
2.4 Certification

Certification is the action of providing an official document attesting to a status or level of achievement of specific characteristics. If certification is used, rather than self-declaration, then a conformity assessment body (either third-party or in-house) conducts a conformity assessment and issues certification of the declared performance. The process commonly followed is illustrated in Figure 2, drawn from that used by the China Energy Conservation Program (CECP). Such schemes may include a factory audit to verify compliance of the ongoing production, but often they simply test multiple product samples and issue test reports and certifications.

[9] UNEP U4E (2019) *Model Regulation Guidelines: Energy-Efficient and Climate-Friendly Air Conditioners* and *Model Regulation Guidelines: Energy-Efficient and Climate-Friendly Refrigerators*, both available at: https://united4efficiency.org/resources/model-regulation-guidelines/

[10] One of the findings of the ATLETE project reported in the first text box was that uncertainty in early EU regulations about whether it was the manufacturer or the supplier (the actor who actually places the product on the market) who was legally liable for the conformity assessment had contributed to non-compliance.

Figure 2: Illustration of the CECP certification process[11]



The advantage of certification is that conformity assessment is by a body that is recognised as competent and independent. However, it does not negate the need for other compliance activities, because unscrupulous suppliers could manipulate the samples (the 'golden sample' problem for which some certification schemes apply tamper-resistant seals), or amend (deliberately or not) the production supply process after certification so the initial results are no longer valid. Nonetheless, certification via a respected, impartial certification body improves confidence that at least the initial sample of the product performs as declared. Therefore, many MEPS and labelling programmes either make it a legal requirement or apply less frequent market surveillance and verification actions for certified products.

[11] China Energy Conservation Program, https://www.certrip.org/cecp/#how. Accessed on 18 December 2021.

Case study: United States (US) ENERGY STAR – Market Surveillance Conducted by Third-party

To preserve the integrity of the ENERGY STAR label, which is the basis for federal procurements and various incentive schemes, the US Environmental Protection Agency (EPA) requires test reports from accredited laboratories and certification by recognized certification bodies (CBs). The system came into effect in 2011 to enhance compliance. In addition to certifying that products meet pertinent criteria before entering the market, CBs conduct ongoing market surveillance to ensure that qualified products meet the program requirements on an ongoing basis. CBs re-test a subset (5 per cent or 10 per cent of certified models depending on the product category) of certified products.

Products are selected through a nomination process as well as at random. The CB must then purchase samples that are commercially available and test them in an EPA-recognized third-party laboratory. Each CB submits a detailed report of their verification efforts to the EPA every six months. The CBs identify non-compliant products for enforcement actions. Participation is a requirement for each manufacturer that opts to pursue the ENERGY STAR label. According to EPA's 2017 summary, 1,702 unique ENERGY STAR-qualified products underwent verification testing with 93 per cent determined to be compliant, indicating that the system is keeping the vast majority of non-compliant products from using the ENERGY STAR label.

Sources: UL and EPA (2018) reported in ASIA EDGE (2020) Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States, prepared by CLASP with support from the US Department of State for the ASIA EDGE initiative,https://clasp.ngo/publications/the-market-surveillance-for-air-conditioners-voluntary-guidelines-for-asean-member-states

2.5 Product registration systems

The establishment of a product registration system (PRS) is good practice to enhance conformity and provide a first point of control. Suppliers need to enter product information into the database. With the system in place, the assigned ministry checks declarations and supporting documentation. If all required information has been provided and automatic consistency checks are satisfactory, the ministry either grants permission for the product to be placed on the market by providing a mandatory registration number or withholds approval until identified issues have been resolved. Additional manual assessment is necessary to verify that all the details have been properly provided and that there are no contradictions or other remaining non-compliance concerns. Such a system helps ensure that there is a systemic third-party inspection of the technical documentation and that the supplier is fully aware of the requirements. It is important that the parameters in the PRS permit calculation of each product's energy efficiency so that the consistency of this information with the declared energy efficiency can be checked. U4E guidance notes on product registration systems further outline best practices.[12] PRS are a very useful complement to testing, but not a replacement.

[12] UNEP U4E (2020) Product Registration System Guidance Notes include: 1) *What is a Product Registration System and Why Use One? 2) Planning to Build a Product Registration System? – Foundational Considerations* 3) *Planning to Build a Product Registration System? 4) Detailed Consideration Implementing a Product Registration*, all available at: https://united4efficiency.org/product-registration-systems/

2.6 Maintenance of records

MEPS and labelling programmes place requirements on how long manufacturers or their authorized representatives must maintain conformity documentation after the product is first placed on the market. The EU requires such documents to be maintained for 10 years after the last unit has been sold and reserves the right to request them from suppliers at any point within this time frame. Setting such a minimum fixed period is necessary to support market surveillance and ensure that necessary documents are not destroyed. Otherwise, a loophole could exist for suppliers to argue that they respected the conformity assessment requirements but did not maintain documentation to prove it. **The time period needs to respect the public interest while avoiding excessive burden for suppliers, so regulators should strike a balance. A minimum of 5 years is recommended**, although periods of 24 months to 10 years are found in existing regulations. If products go through third-party conformity verification and are in a product registration system, this is not as critical. The EU requires information in its registration system, European Product Database for Energy Labelling (EPREL), to be maintained for 15 years after the last unit has been sold.

2.7 International alignment

Large economies have substantial market value and can set conformity assessment requirements that suppliers are likely to abide by, even if they are relatively onerous. For smaller economies, the market may be less inclined to abide by nationally specific conformity assessment requirements if the original equipment manufacturers (OEMs)are the responsible parties and if there is no state-supported conformity assessment option.[13] **Aligning conformity assessment requirements with those used in compatible (in terms of product type and regulatory similarity) large economies can help ensure that suppliers can procure products from OEMs that have had conformity assessment conducted in accordance with the specifications**.[14] If not, there is a risk that suppliers will fail to find OEMs that sell products assessed with the national specifications.

An alternative approach for smaller markets is to group together to make a larger market with common conformity assessment requirements. This regional harmonisation approach is being pursued in the Economic Community of West African States (ECOWAS), the East Africa Community (EAC), and the Southern African Development Community (SADC), whilst the Association of Southeast Asian Nations (ASEAN) is building upon its existing experience in this arena to enhance the stringency of its MEPS and labels. Even here it makes sense to align as many of the technical requirements as possible with widely used international norms. ECOWAS is currently considering MEPS and labelling requirements that have technical reporting requirements aligned with IEC and ISO test procedures.

[13] In Tunisia, the eligible conformity assessment option is provided by the regulatory authorities and suppliers simply pay conformity assessment testing fees to access it and have products certified prior to being placed on the market. Importers are not dependent on OEMs' willingness to supply products that have had conformity assessment conducted per the national requirements. The technical aspects of the conformity assessment are essentially harmonised with the EU's, so importers know in advance the energy efficiency of products prior to their arrival and the conformity assessment within the import country. This minimises non-compliance risk for importers.

[14] Consideration of robust requirements from well-established markets underpins the U4E Model Regulation Guidelines.

3. Market Surveillance

Market surveillance is the action of authorities checking that products in the market comply with regulations. It is comprised of monitoring, verifying (with optional risk screening), and reporting. The aim of market surveillance is to ensure that:

- Products subject to energy labelling display the label with the correct information.
- Energy performance and related technical specifications (e.g. pertaining to electrical supply, refrigerants, etc.) are in line with the claimed performance and respect the regulations.
- Products are registered in accordance with the regulations.

Market surveillance combines monitoring with conformity verification.[15] In addition, authorities should also raise awareness of the obligations and provide training. All market surveillance operates within cost constraints, so the value proposition needs to be communicated to the finance ministry (and donors if a programme receives technical assistance funding) to secure appropriate resources. It should also be conveyed to affected companies so that they understand the value of a fair playing field that applies to all vendors. Strategies should be designed to optimize compliance for the resources allocated.

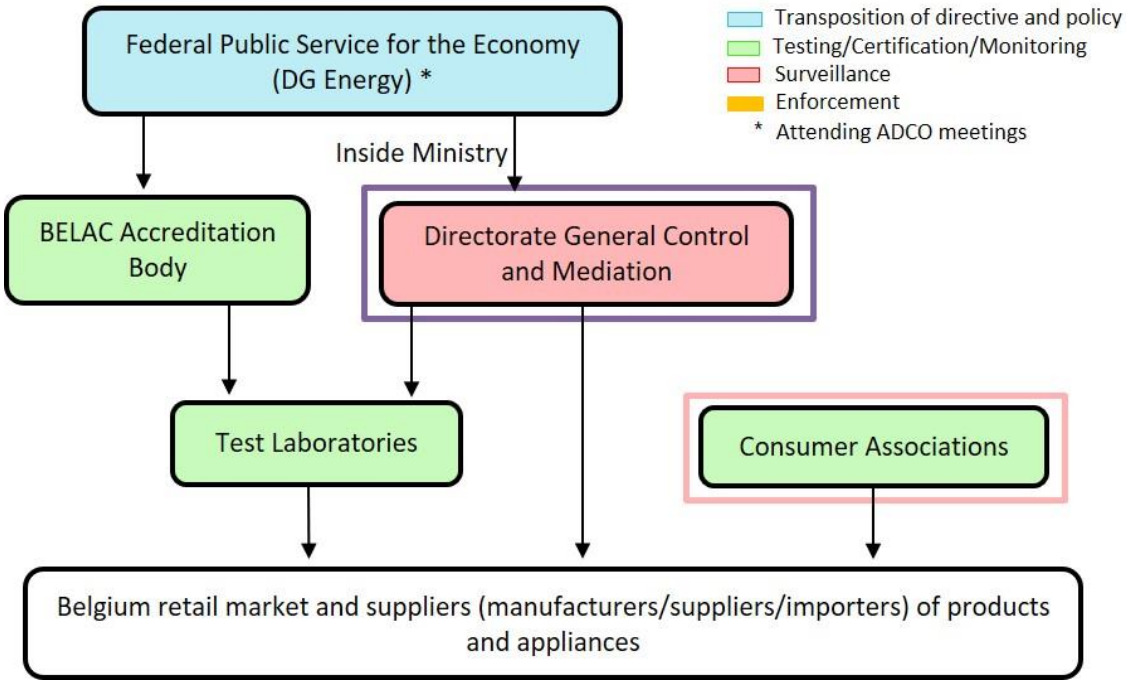
3.1 Market surveillance management and responsibilities

Market surveillance is conducted by a designated market surveillance authority. As market surveillance is also required for electrical safety, compliance with the Montreal Protocol, and so forth, surveillance functions may be conducted in the same agency rather than separately to avoid duplication of efforts. The techniques are similar, so there can be synergies that provide better value for money. However, **adequate market surveillance must also be carried out for energy performance reasons, and the responsible agency must be adequately invested in this arena**.

The approach typically depends on the primary legislation and the relevant responsibilities of line ministries. In the simplest case, market surveillance and enforcement (see Section 4 for details) fall within the mandate of the same ministry that is responsible for the primary legislation. An example is Belgium's Federal Public Service for Economy Ministry, that is responsible for energy regulations and also has a Directorate General for Control and Mediation responsible for market surveillance and enforcement. Close linkages and oversight responsibilities across relevant government agencies will help to minimize the potential for corruption. Third-party test laboratories are appointed by, and report to, the Ministry and are accredited by the Belgium accreditation agency, BELAC, which is managed by the Ministry. This relationship is illustrated in Figure 3. Seamless cooperation is more likely when all relevant entities are part of the same agency. Often, responsibilities are dispersed, and cooperation has to be fostered.

[15] Conformity verification is distinct from conformity assessment (addressed in Section 2).

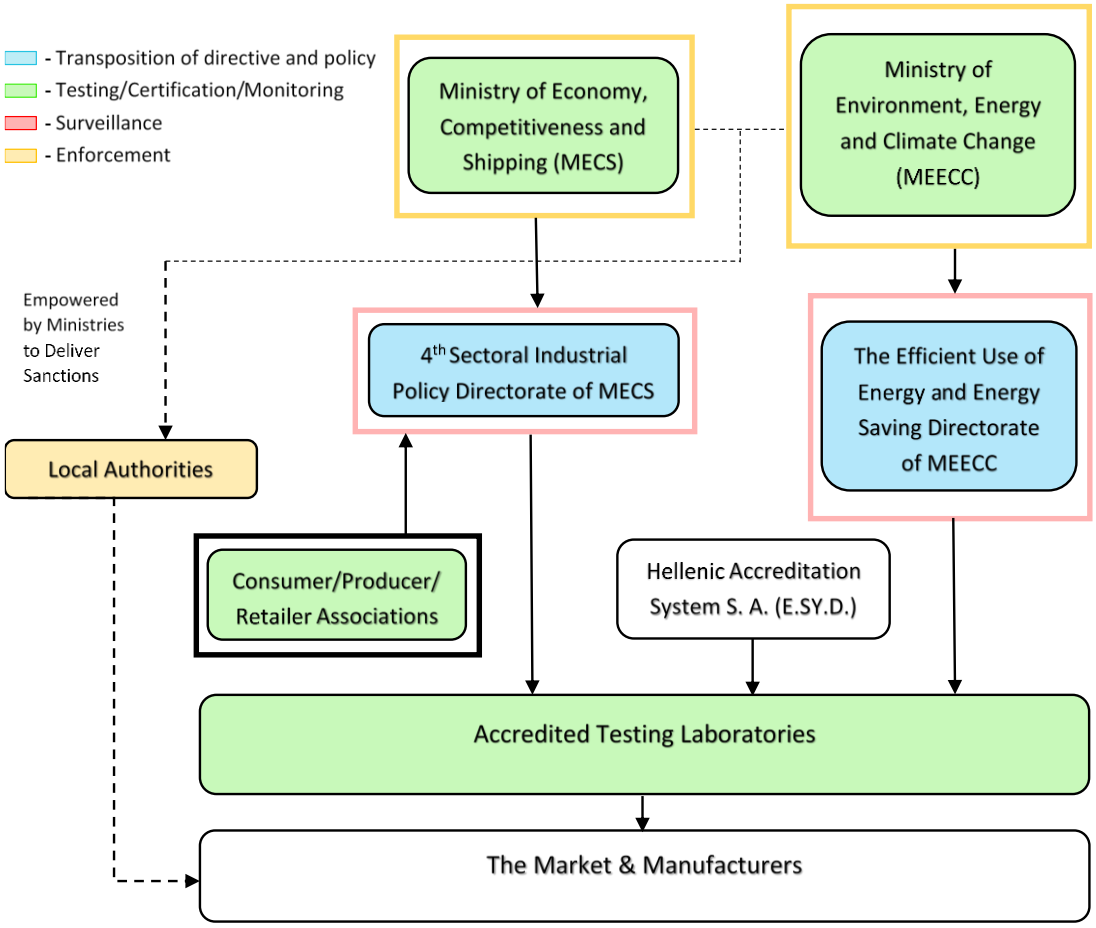
Figure 3: Institutional map for energy labelling compliance stakeholders in Belgium[16]



In Greece, agencies with responsibility for energy labelling used to be more heterogenous than they are as of this writing. An example of the arrangements that applied in 2011 is shown in Figure 4, when the Ministry of Environment, Energy and Climate Change (MEECC) and the Ministry of Economy, Competitiveness and Shipping (MECS) were jointly responsible for domestic application of EU energy labelling requirements. Both held responsibility for monitoring the market and instigating enforcement actions. However, sanctions were issued by Local Authorities (LAs). The Hellenic Accreditation System S.A. (ESYD) had responsibility for accrediting labs, while consumer associations undertook testing and reporting to MECS. A producers' association monitored compliance by its members, and a similar system was established by the retailers' association. These overlapping arrangements led to confusion.

[16] ADCO is the EU Market Surveillance Administrative Cooperation (ADCO) on Ecodesign and Energy, established by European MSAs to support cross-border cooperation and best practice sharing within the EU Single Market.

Figure 4: Institutional map for energy labelling compliance in Greece circa 2011



Market surveillance and enforcement responsibilities in Greece have since been centralized under the Ministry of Economy, Development and Tourism's[17] General Secretariat of Industry under the Directorate of Technical Industrial Legislation.

3.2 Market monitoring

Market monitoring entails gathering information on products in the market and associated suppliers, distributers and retailers. The first action of market monitoring is to gather intelligence on who is supplying products to the market by gathering information through surveys of chambers of commerce, trade and industry associations, line ministries (e.g. trade, commerce and industry, and customs), importers, distributors and retailers. **If there is a mandatory PRS, market actors and product data should be visible. It is recommended that such a system be put in place as soon as practicable.** Market surveillance agencies should conduct supplemental research if clarifications are needed on the supply of each product type that they oversee.[18]

[17] The successor to the Ministry of Economy, Competitiveness and Shipping.
[18] UNEP U4E (2021), *Protocols to Conduct Market and Impact Assessments,* available at https://united4efficiency.org/resources/publications/

3.2.1 Gathering general market intelligence

In markets where all products are imported, Customs is the first place to gather the required information. Customs Authorities are notified each time a shipment enters the country, and they conduct assessments to gather requisite customs information. These include which harmonised customs code the goods are classified under, the weight and value of the shipments, and details on the importer (See Section 3.3.4 of Protocols to Conduct Market and Impact Assessments).[19] Customs authorities verify that the necessary documentation is available, and that the product is properly registered, if applicable. If MSAs access this information, they can rapidly identify the major importers and subsequently survey how they sell into the internal market. This should help clarify the distribution networks as well as the distributors and retail outlets. If there is a domestic industry, it is necessary to establish their production volumes and determine the supply chain they use to sell into the domestic market. Exports and re-exports (where imported products are later exported for sale in other markets) can also be significant and these channels need to be understood.

3.2.2 Gathering details on specific models

Once the MSA has sufficient general market intelligence, they can gather data on specific models with the aim of deciding whether to conduct conformity verification. Product registration systems should be used if possible. Initial (and if needed, supplemental) surveys can be conducted in retail outlets, by reviewing online retail information, reviewing customs data, and/or checking supplier distribution depots. The information can also support programme design and impact assessment work as discussed in the U4E guidance on protocols to conduct market and impact assessments.[20] **For MSAs to gather the market and model information, suppliers should be obligated to cooperate.** This could be specified in the product regulation, in higher level framework legislation, or in broader legislation concerning responsibilities of suppliers and vendors to cooperate with regulatory authorities.

3.2.3 Using data from a product registration system

The data compiled within a PRS should be used to inform decisions about whether a supplier or retailer should be the subject of conformity verification. A PRS helps risk screening assessments, and based on this, determines which models should be sampled for verification checks. As market intelligence has commercial value, MSAs should limit access to any non-conformity risk related information to designated staff and their operatives and ensure adequate security systems are in place to prevent unauthorized access.

For each product in the system, there should be information on the supplier, the model name/serial number, the country where the product was manufactured, the date the product registration was made and when it was approved, a declaration of conformity signed by the legal representative of the supplier, supporting technical documentation and test reports, plus any relevant information on the compliance status of the product. Sometimes a PRS may also

[19] Ibid
[20] Ibid

contain information on the number of units that are imported or placed on the market, but this commercially sensitive information needs to be strictly confidential and securely maintained.

For refrigerating appliances, the following technical information should be provided:[21]

- Type of unit [e.g. refrigerator, refrigerator-freezer, freezer or more categories as needed].
- Volume of the different compartments and an indication of whether they are frost-free.
- Energy consumption in kWh/24 hours at each ambient temperature (°C or °F) used in the energy performance test procedure.
- Reference ambient temperature[s] used in performance rating.
- Climate class (when used).
- Rated performance grade under the local energy label.
- Type and amount of refrigerant and foam-blowing designation in accordance with ISO 817 or ASHRAE 34, including ozone-depleting substances (ODP) and global warming potential (GWP).
- Test report(s).

For room air conditioners, the following technical information should be provided:[22]

- Type of unit [e.g. ductless split, self-contained, or portable].
- Rated cooling (and heating, if applicable) capacity in kW at each rated test condition
- Rated power consumption in kW at each rated test condition.
- Rated performance grade under the local energy label.
- Rated energy efficiency in coefficient of performance (COP), cooling seasonal performance factor (CSPF), seasonal coefficient of performance (SCOP), seasonal energy efficiency ratio (SEER) and yearly electricity consumption in kWh.
- Type and amount of refrigerant designation in accordance with [ISO 817 or ASHRAE 34], including ODP and GWP.
- Test report(s)

This information can then be subject to fully or partially automated checks to confirm that the data are consistent and that the declared values respect the requirements in the regulations.

[21] UNEP U4E (2019) *Model Regulation Guidelines: energy-efficient and climate-friendly refrigerators*, see Product Information section at page 15.
[22] UNEP U4E (2019) *Model Regulation Guidelines: energy-efficient and climate-friendly air conditioners,* see Product Information section at page 17.

3.3 Conformity verification

Conformity verification is the process that MSAs undertake to verify that products placed on their market conform to the regulatory requirements. Without it, unscrupulous market actors can cheat and enjoy the benefits of the market without consequence, which diminishes the intended impact of the policy measure and creates an uneven playing field that disadvantages law-abiding actors.

Conformity verification begins with the MSA but links to customs authorities who are responsible for some level of inspection of products to ensure they are approved for entry when they record customs data. Customs authorities need to be informed of MEPS and labelling activities and be actively engaged. This needs to include training of customs officials (see Case study: Training of Customs Officials in Jordan), linking compliance software tools, and establishing inspections at custom authority control points with supporting back-office expertise supplied by the MSA. Where product registration systems are used with a remote pre-approval mechanism, customs authorities should have access to the database of compliant registered products to be able to verify that the imports are in the database and permitted to enter the country. Also check products manufactured within the country, check retailers, and respond to complaints of non-conformity.

The degree to which conformity verification actions are systemic or only conducted at the request of the MSA is a trade-off, balancing careful consideration of the cost and complexity relative to the benefit of enhancing compliance. The types of conformity verification, ordered from least costly but least certain, to most certain and more costly, include:

- Documentation inspection and consistency checks.
- Visual inspections at point of entry.
- In-person inspections at stores and online distribution facilities.
- Verification testing at laboratories on energy performance and the stated refrigerant gas and foam blowing agent.

Case study: Training of Customs Officials in Jordan

Jordan introduced a draft of MEPS and labelling requirements from 2013 that were fully aligned with those in the EU. The vast majority of affected products are imported and cross the border at one of several land routes. As part of the market surveillance process, the Jordanian Standards and Metrology Organisation (JSMO) established a dedicated training programme for customs officers checking imports. Market surveillance experts from EU countries supported capacity building in 2017 on the technical requirements. This means that customs units operating at each border crossing had adequately trained staff to conduct primary documentation checks and verify that shipments meet the requirements. The border staff are backed by a centrally-managed technical support unit that can resolve more challenging issues and coordinate risk assessments as well as additional verification checks.

Source: Communication with programme managers at JSMO

The case study below from Ghana illustrates how some of these verification actions can be incorporated into a compliance regime.

Case study: Ghana's MEPS and Energy Labelling Compliance Regime

The Ghana Energy Commission uses:

- Requirement to submit technical documentation into a PRS.
- Verification of registration information (accreditation of third-party laboratories).
- Market checks for displaying energy labels.
- Market checks for mislabelled products (wrong format, colours, language, etc.).
- Verification of nameplate information against the product registration system entry.

Requiring test results from an accredited third-party laboratory before entry into the market reduces non-compliance. Subsequent market checks help ensure that, at a minimum, products are properly labelled. A dedicated official is embedded with the customs authority to support this work.

Source: UNEP U4E, AEME, Energy Commission of Ghana, ECREEE (2020) Lessons learned from Ghana's experience with Energy Efficiency Interventions for Cooling Products, ECOWAS Refrigerators and Air conditioners initiative (ECOFRIDGES)

3.3.1 Documentation inspection

Documentation inspection is relevant for all MEPS and labelling schemes, but especially for those that allow self-declaration of performance, and in markets with limited resources to adopt market surveillance. It is an activity that can be centrally managed, and/or handled via customs authorities with a dedicated MSA at relatively low cost.

Documentation inspection starts with a review of the entries and documents in a product registration system. If a system is not place, the party placing a product on the market is required by the MSA to supply documentation of the claimed energy performance. This typically includes:

- A unique model identification code and brand, plus a list of all the equivalent products/models that are addressed by the same technical supporting evidence.
- The claimed technical characteristics of the product, including its energy consumption and related capacity information in accordance with the specified test procedure.
- The energy labels.
- The energy performance test reports which underpin all the claimed technical characteristics required to illustrate that a product satisfies the specified MEPS and/or energy labelling regulations.
- Details of the refrigerant and blowing agent.
- Details of the test laboratory that conducted the tests.
- A conformity assessment report (declaration of conformity).

The MSA checks the documentation to ensure that all requirements are met. Typically, this includes entering the information into software to ensure required fields are complete and that the information reported is consistent with MEPS and labelling requirements, as well as self-consistent (e.g. no part of the information contradicts any other part). Some steps can be automated in a product registration system. When a product fails a document inspection and the market actor has not complied (knowingly or otherwise), MSAs take remedial action. If a product passes the documentation inspection, it demonstrates that the supplier is aware of the requirements, but it does not prove that the product complies, because the claimed performance could be inaccurate or falsified. Compliance can only be fully established via verification testing.

Periodic re-checking in critical. MSAs that operate product registration systems may perform continuous and partly automated inspections of products to verify that products are registered and authorized for sale, and that all documents remain available. Typically, MSAs train their inspectors on how to conduct documentation inspections and prepare relevant guidance material to support them in their work. In addition, physical testing should be performed on a sample of registered products to ensure that the claimed characteristics are consistent with the information in the database. This will include guidance on when to request documentation (if not part of the product registration process) and the information that needs to be in the documentation.

3.3.2 Visual inspections

Visual inspections undertaken by MSA or customs check if a product appears to be consistent with the regulatory requirements. A visual inspection can help determine whether more definitive verification assessment is required, such as if a product is clearly defective or has characteristics that do not match (e.g. a refrigerator is smaller than claimed or has a different configuration(freezer on the bottom rather than the top), different refrigerant gas stated on product rating label and on technical documentation, etc.). A visual inspection can also verify that the information on the energy label is consistent with that claimed in the technical documentation. Such inspections are complementary to documentation inspection and verification testing and may serve as a simple risk screening method.

3.3.3 In-store and online store inspections

In-store and online store inspections are the only means of ensuring that energy labels are displayed properly at the point of sale and that the information is consistent with the claimed label class and other details listed in the product registration system and/or from documentation checks. They require coverage of retail outlets and online retailer warehouses across the market and are rather resource intensive. They are particularly important at the early stages of a labelling programme to ensure retailers are aware of, and respecting, the regulatory requirements. The frequency and geographic coverage can be reduced for mature programmes when retailers are well-versed with the requirements and compliance is high.

Inspection is also needed for online retailer websites that sell products to ensure that required energy labels are properly shown. Energy labels need to be shown on such websites to help consumers make an informed decision.

It is helpful if MSA officials are equipped with the same software used for documentation checks to speed up the process, ensure correct results, and report results to centrally managed databases. Providing inspectors with a checklist for inspections can also be helpful (see Case study: Criteria Applied by Hessische Eichdirektion in Label Inspections).

To conduct these inspections, MSAs need to develop a sampling plan that provides the best coverage within the budget, while ensuring all relevant retailers are considered. It can help to publicise that inspections are taking place (but not where).

Case Study – Criteria Applied by Hessische Eichdirektion in Label Inspections

The German market surveillance authority in the state of Hessen, Hessische Eichdirektion, provides its inspectors with a checklist for label inspections. The checklist includes an example of a correct energy label and a number of parameters that the inspector must review, including:

- Is the energy label present?
- Is it found in the correct place?
- Is it immediately possible to link the energy label to the product?
- Is the content correct?
- Are the colours correct?
- Is the size correct?

Source: EEPLiant (2019) Energy Efficiency Compliant Products 2 - EEPLIANT2 Grant Agreement N°752591
https://eepliant.eu/images/Documents/EEPLIANT2/WP2/Best_Practice_Guidelines_EEPLIANT_v41_2.pdf

3.3.4 Verification testing

Verification testing is the definitive step to determine a product's compliance. It can only be carried out by a qualified and impartial laboratory operating under contract to the MSA. This can be time consuming and expensive, so strategies must be devised to maximise the compliance benefit. MSAs should acquire samples according to a risk-based selection methodology (e.g. India uses an algorithm), ship them to designated test laboratories, process the results, and take any enforcement measures in the event of non-compliance. For a programme's integrity, there should always be a possibility that any product may be selected for verification testing regardless of the compliance risk.

Once the products to be tested have been selected, samples are procured for verification testing. As unscrupulous suppliers could retain 'golden samples' that comply while the majority of the seemingly identical products on the market do not, MSAs should select products at random from the market. The simplest way to do this is to purchase the product samples from the market directly, in which case the original supplier would be unaware. This may be more costly than requesting a product from a supplier but ensures integrity. Care must be taken to ensure the selected sample has not been damaged before it its acquired and that it is delivered safely to the test laboratory. Failure to do this can imperil the legally enforceable validity of the compliance findings.

The verification process, i.e., how many units will be tested and the requirements for compliance, should be clearly stated in the regulation, so the manufacturers and importers are aware of the process for verification. This process can vary from country to country, see the example Case study: Verification Testing in Singapore. Furthermore, it should also be clear who pays the cost of the verification test at each stage of the process. It is common that the manufacturer/importer covers the cost when the product fails on compliance, while the MEPS and labelling programme covers the cost if the model passes the requirements. In India, third parties, such as competitors or consumer associations, can also request a verification process (known as Challenge Test), in this case, if the model passes the requirements of the verification test, the third party that initiated the process covers the costs.

The test laboratory for verification testing needs to be independent and accredited in accordance with *ISO/IEC 17025, General requirements for the competence of testing and calibration of laboratories*. It should also be accredited to test the specific product in accordance with the energy performance test standard specified in the MEPS and energy labelling regulations. Accreditation alone may be insufficient for a test laboratory to produce results that are consistent with those found by other laboratories with an established track record. If a test laboratory with no established pedigree in testing the product is being considered, MSAs need to ensure it has conducted cross-testing with a well-respected international laboratory. In this process, also known as inter-laboratory comparison testing, a product sample is first tested in the international laboratory and then shipped to the newly designated testing laboratory. Testing in the latter should be witnessed by a tester from the well-established laboratory, and the results compared. Once repeatable test results are produced within an acceptable margin of error, the MSA can be confident that their laboratory will yield legally enforceable test results. It may be cheaper and more reliable to send products for verification testing to a reputable, independent international laboratory rather than establish a local laboratory for verification testing. Many MSAs maintain lists of laboratories accredited to conduct such testing and put the verification testing out to tender.[23]

[23] For example, Table 1 refers to Nigeria maintaining a list of internationally accredited third-party laboratories recognized for conformity assessment certification. The same laboratories could be used for verification testing.

Case study – Verification Testing in Singapore

Singapore's verification testing process consists of two stages:

- In Stage 1, the National Environment Agency (NEA) selects a random sample of registered goods for verification testing. Suppliers of the selected models provide NEA with samples for testing, which NEA selects and seals at the warehouses. NEA engages a contractor to collect and test the samples, either locally or abroad, and then compares the verification test results against the test reports submitted by suppliers during registration. If the results are within conformance limits, generally within 3-15 per cent of supplier's declared test result depending on the measured parameter and type of equipment, the verification testing is complete.
- Stage 2 initiates further testing for samples that fail Stage 1. Suppliers are required to provide two additional units of the product for testing. If the average energy performance results for the two new samples are within conformance limits, the model is considered to have passed. If the results are outside of the conformance limits, the NEA cancels the product's registration.

For the first verification testing in 2014, NEA randomly selected 46 registered products. They engaged a Singapore Accreditation Council (SAC) accredited local laboratory, TÜV SÜD, to perform verification testing. TÜV SÜD tested 26 products locally, and contracted a laboratory in Guangzhou, China to test 20 models. Singapore was able to cost-effectively export some of the testing to China because the testing company in Guangzhou was accredited by the China National Accreditation Service for Conformity Assessment (CNAS), and CNAS had signed a mutual recognition agreement (MRA) with SAC to recognize each other's results.

Sources: CLASP, NEA reported in ASIA EDGE (2020) Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States, prepared by CLASP with support from the US Department of State for the ASIA EDGE initiative. https://clasp.ngo/publications/the-market-surveillance-for-air-conditioners-voluntary-guidelines-for-asean-member-states

3.3.5 Costs of verification activities

Market surveillance authorities can either subcontract qualified third-party testing laboratories or establish their own laboratories for verification testing. An international survey of testing costs conducted in 2018 on behalf on the Super-Efficient Equipment and Appliance Deployment (SEAD) programme [24] reported the results shown in Table 2 for refrigerators and Table 3 for air conditioners. [25] The findings are derived from an international survey of 400 to 500 test laboratories and practitioners, of which between 100 and 150 responses were received.

[24] http://www.superefficient.org. Accessed on 17 August 2020.
[25] SEAD (2019), *Global Appliance Testing Costs Catalogue, Analysis of Appliance Energy Efficiency Testing Costs* https://storage.googleapis.com/clasp-siteattachments/2019-SEAD-Global-Appliance-Testing-Costs-Catalogue.pdf

Table 2: Domestic refrigerators – laboratory capital and operational costs

Expense Category	Low Estimate (USD)	High Estimate (USD)	Description
Capital Costs			
Refrigerator-specific equipment	$252,000	$602,000	Test chamber[26] for multiple units, air handling system, chiller, control and measurement equipment, test loads and conditioning, software.
Generic equipment (usually pre-owned)	$3,000	$5,000	Voltage stabilizer, ambient temperature controls, meters and sensors.
Accreditation	$5,000		To ISO 17025
Inter-laboratory trials	$5,000		For calibrating proficiency
Operational Costs			
Staffing	2		Minimum number of trained technicians
Space	50m^2		Minimum space requirements
Equipment calibration and maintenance	$2,000		Estimated annual cost
Capacity building, staff training, laboratory re-accreditation, re-certification	$2,000		Estimated annual cost

Table 3: Air conditioners – laboratory capital and operational costs

Expense Category	Low Estimate (USD)	High Estimate (USD)	Description
Capital costs			
Air conditioner-specific equipment[27]	$350,000	$650,000	Room calorimeter, control air space chamber, compressor condensing units, air handling unit, humidifiers, pressure equivalence devices, water calibration system, air sampler and psychrometer box (complete setup and commissioning)
Generic equipment (usually pre-owned)	$3,000	$5,000	Voltage stabilizer, thermometer, hygrometer, sampler, etc.
Accreditation	$5,000		To ISO 17025
Inter-laboratory trials	$5,000		For calibrating proficiency
Operational Costs			
Staffing	2		Minimum number of trained technicians
Space	60m^2		Minimum space requirements
Equipment calibration and maintenance	$10,000		Estimated annual cost
Additional operating costs: capacity building, staff training, re-accreditation, re-certification	$2,000		Estimated annual cost

[26] One of the key factors that underpins the cost range is the test chamber size.
[27] One of the key factors that underpins the cost range is whether air enthalpy (relatively inexpensive) versus a calorimeter method (expensive) is used.

The range in qualified third-party laboratory testing prices for one unit as a function of the region, the product type and test standard applied are shown in Tables 4 and 5.

Table 4: Testing prices for domestic refrigerators[28]

Region	Product Category	Applicable Test Standards	Source	Price for 1 unit (USD)
Asia	Domestic refrigerators	• IEC 62552 • ISO 7371 • EC 643/2009	Accredited test labs, practitioner	$885 – $2,500
Middle East and North Africa	Domestic refrigerators, frost-free refrigerators	• ISO 15502:2005 • EC 643/2009 • SASO 2892:2018 • IEC 62552 • ISO 7371	Accredited test labs, practitioner	$480 – $2,939
Latin America	Domestic refrigerators, double door refrigerators	• NOM-015-ENER • ISO 15502:2005 • IEC 62552	Accredited test labs	$930 – $3,000
Other Regions	Domestic refrigerators	• ISO 15502:2005	Accredited test labs, practitioner	$1,770 – $2,360

The SEAD study reports the following potential causes of differences in refrigerator testing prices:

- Testing is based on monitoring the temperature and measuring the volume of each compartment. Energy efficiency is assessed as one unit relative to another. The presence of more compartments means a more complex test and higher costs.
- The presence of a freezer compartment (as opposed to a single door refrigerator/freezer unit) pushes the price of testing up significantly due to the need for freezing capacity testing. Testing a freezer or fridge-freezer costs around 50 per cent more than a simple refrigerator. Most household refrigerating appliances are refrigerator-freezer type.
- Some regional policies (including in the EU) include noise testing as part of the energy label check, which requires a special test chamber. This can add 20 per cent to the testing cost if the laboratory has a noise testing facility but could add 50 - 60 per cent if the test is subcontracted.
- Shipping products internationally for testing is problematic in some regions. In Africa, refrigerants may have to be removed to comply with rules for safe transportation in some countries and with some carriers. Doing so could invalidate the legal viability of test results for non-compliant product that can be used as proof for enforcement actions.
- Test procedures and quoted pricing involves the testing of only one appliance, but some surveillance authorities require test results from a further three models if one model fails.

[28] SEAD (2019), *Global Appliance Testing Costs Catalogue, Analysis of Appliance Energy Efficiency Testing Costs* https://storage.googleapis.com/clasp-siteattachments/2019-SEAD-Global-Appliance-Testing-Costs-Catalogue.pdf

Table 5: Testing prices for room air conditioners[29]

Region	Product Category	Applicable Test Standard(s)	Source	Price for 1 unit (USD)
Africa[30]	Split and unitary	• ANSI/AHRI 1230-2010 • EN 12102	N/A	N/A
Asia	Split and unitary	• ISO 5151: 2010 • ISO 15042: 2011 • ISO 16358	Accredited test lab(s)	$350 – $6,825[31]
Middle East & North Africa	Split and uncategorized	• EU 206-2012 • ISO 5151: 2010 • BS EN 14825- 2016	Accredited test lab(s)	$1,040 – $8,057
Latin America	Split and unitary	• NOM-026-ENER • ISO 5151: 2010 • Various national standards	Accredited test lab(s)	$450 – $3,360
Other Regions	Split and unitary	• ANSI/AHRI 1230-2010 • ISO 5151:1994 • EN 12102:2013 • EU 626/2011	Accredited test lab(s), policy documents	$4,733 – $11,101

The SEAD study reports the following potential causes of differences in air conditioner testing prices:

- The level of detail and complexity of the test requirements; more detail and complexity results in higher prices.
- Product characteristics and design features, such as fixed- versus variable-speed compressors, cooling and heating versus cooling only functionality or unitary window mounted systems versus wall mounted split units or split versus multi-split systems.
- Variations across markets as prices are based on what the market will bear (what consumers are able and willing to pay).

Details on the test chamber and equipment specifications are given in Annex B.

3.3.6 Risk screening

As market surveillance budgets are invariably constrained and some conformity verification actions are more costly than others, strategies need to be devised to achieve the maximum compliance for the budget available. Risk screening is part of this process. **Rather than send samples of all products for verification testing, it is better to target testing at products which are more at risk of non-compliance.** MSAs have developed criteria to determine non-compliance risk (for an example, see Case study: Australia's Criteria-based Verification Testing).

[29] SEAD (2019), *Global Appliance Testing Costs Catalogue, Analysis of Appliance Energy Efficiency Testing Costs* https://storage.googleapis.com/clasp-siteattachments/2019-SEAD-Global-Appliance-Testing-Costs-Catalogue.pdf

[30] In the case of Africa this may be out of date. Most African countries are now using IEC/ISO standards, with some using European (EN) standards.

[31] Part of this significant difference in testing costs may be attributable to the much greater cost incurred in testing multi-split units (under ISO15042) compared to standard split-units and unitary units.

Much of the information used in risk screening assessments can only be acquired over several years of operating a programme. Thus, initially verification testing might be targeted more towards high selling products, products that claim the highest energy performance, products with a high impact on energy and greenhouse gas savings, or (especially) towards any products which are the subject of complaints or tip-offs. If certain producers or suppliers have a poor compliance track record in other regulatory domains, e.g. product safety, then that can also be used to inform non-compliance risk assessments for verification testing. However, the sample selection also needs to include a part chosen purely at random to ensure that any product could be selected and to allow compliance profiles of all market actors to be established over time.

Case study – Australia's Criteria-based Verification Testing

Australia's Greenhouse and Energy Minimum Standards (GEMS) Regulator is responsible for testing products for compliance. The GEMS Regulator selects a cross-section of models via a criteria-based approach that prioritize models for testing based on:

- Information and intelligence on the model's actual energy efficiency performance
- Brands with a history of non-compliance or lack of verification testing history
- Product types with a history of non-compliance
- Test labs with a history of publishing inaccurate test reports
- Models with a large market share
- Product types that use more energy or produce more greenhouse gases emissions
- Models making high energy efficiency claims relative to competitor models
- Newly regulated products
- Models not recently tested by the GEMS Regulator

From July 1, 2016 to June 30, 2017, the GEMS Regulator checked eighty-six models across twelve product areas. Of thirteen air conditioner models that were tested, eleven (85 per cent) passed Stage 1 testing and the two models (15 per cent) that underwent Stage 2 testing failed and had their registrations cancelled. By utilizing a criteria-based approach, Australia can identify and test those models with a higher risk of non-compliance and those products which, if non-compliant, will have a large impact on energy consumption and greenhouse gas emissions. A random approach to model selection may have prevented identification of the two non-compliant models detected in the 2016-2017 round of verification testing.

Source: Australian Government GEMS Regulator reported in ASIA EDGE (2020) Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States, prepared by CLASP with support from the US Department of State for the ASIA EDGE initiative. https://clasp.ngo/publications/the-market-surveillance-for-air-conditioners-voluntary-guidelines-for-asean-member-states. *Note, recent information on the results of check-testing in Australia are available at:* https://www.energyrating.gov.au/document/report-check-testing-results-july-december-2019

To avoid accusations of bias, the criteria for targeting products should be publicly reported in administrative guidelines published by compliance authorities. Case study: Australia's Criteria-based Verification Testing shows one example; however, other criteria can also be used. For example, depending on the nature of conformity assessment options which a programme permits the level of inspection of imported products at the customs might also depend on the type of conformity assessment, with higher non-compliance risk ascribed to self-certified products than those where third-party certification was conducted in an approved laboratory.

3.4 Funding MSA activities

Market surveillance and enforcement measures are continuous activities that require an adequate operational budget. Costs are generally higher at the outset when the requirements are less well understood, and more surveillance is necessary to ensure market actors are aware of how to comply. Screening measures increase with a programme's maturity, so these are less effective at targeting non-compliance with new initiatives. Moreover, regular communications and a dedicated, public-oriented information source are critical. One example is Australia's website where market surveillance results are published, and:

- Consumers can learn more about the benefits of the program (MEPS and label).
- Retailers can learn about their responsibilities and about the programme.
- Suppliers can learn about their responsibilities and access important documentation.[32]

Regulators need to make the case for a market surveillance and enforcement budget early in the regulatory development process, clarifying the value proposition and the delivery mechanisms and developing a fully costed budget for approval. Funding can sometimes come from an energy authority or a national utility (as a regulator approved demand side management measure), but often the request will be made under the central government budget. Other sources may include fines levied on suppliers of non-compliant products and product registration fees, but these may be insufficient to cover all costs if not levied on every product.

For programmes that operate mandatory third-party conformity assessment within a single designated laboratory, such as Tunisia, suppliers may be charged the conformity assessment testing fee. However, even in this case, the MSA[33] finds it is necessary to do some intermittent verification testing of products chosen randomly from the market. India is another example, wherein the Bureau of Energy Efficiency (the state agency that operates the labelling programme) requires suppliers to apply for an energy label issued by the Bureau and to pay a fee. This fee is used to cover some of the programmatic costs such as market surveillance. Another approach is summarized in the Case study: Thailand/EGAT Budget for Market Surveillance.

[32] Australian Government, Department of Industry, Sciences, Energy and Resources, https://www.energy.gov.au/households/appliances. Accessed on 26 November 2020.
[33] The ANME - Agence Nationale pour la Maîtrise de l'Énergie, http://www.anme.tn/. Accessed on 26 November 2020

For some countries, donor funding helps offset these initial costs. As a rule of thumb, if more than 10 per cent of regulated products do not comply with energy efficiency requirements, more energy could be saved from investing in compliance measures than from regulating a new category of product.[34] This is especially true for refrigerators and air conditioners, which are among the products with the highest energy and operating cost savings potentials. The main costs for market surveillance include capital set-up for offices and equipment, staff, procurement, transport, testing and disposal of products following testing. If the verification testing is to be managed by the MSA, the cost of establishing and operating the test laboratories will likely be the largest cost component.

Case study: Thailand/EGAT Budget for Market Surveillance

Thailand's Demand Side Management and Planning Division (DSM) office under the Energy Generating Authority of Thailand (EGAT) administers their market surveillance programme. EGAT fully funds the market surveillance programme from its budget. In 2017, the annual budget for in-store inspections for all products under the labelling program was about 3 million Thai Baht (~USD 87,000), which did not include programme administration and reporting. In the same year, EGAT spent around 1.5 - 2 million Thai Baht (~USD 44,000 - USD 59,000) to purchase about 60 AC models for verification testing. EGAT conducts market inspections, which includes inspecting labels and purchasing samples five times a year in five regions (4-5 days per region), and over 10 times a year in a Metropolitan area.

EGAT brings to retail stores a list of pre-defined AC models for sample purchasing. EGAT collects only one sample per selected model. EGAT uses a convenience sampling (those most practicable to engage) method to select retail stores, which they randomly inspect – averaging around 2-3 stores a day. The annual cost of verification testing is about 1.2 - 1.4 million Baht (~USD 38,000 - USD 44,000). Testing models at the Electric and Electronics Institute (EEI) laboratory costs 16,250 Baht (~USD 511) for fixed-speed ACs and 23,750 Baht (~USD 747) for variable-speed ACs.

In 2018, to minimize testing costs, EGAT started requiring domestic manufacturers and importers to cover the product purchase. After EGAT pays for a randomly selected sample, the manufacturer or importer repays EGAT and takes the product back after testing. If the sample fails testing, EGAT allows them to randomly select another sample of the same model for a second round of testing. The manufacturer or importer is required to cover costs of purchasing and testing the second sample.

Source: EGAT (2018) reported in ASIA EDGE (2020) *Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States*, prepared by CLASP with support from the US Department of State for the ASIA EDGE initiative. https://clasp.ngo/publications/the-market-surveillance-for-air-conditioners-voluntary-guidelines-for-asean-member-states

[34] The EEPliant3 project includes estimates of the value of the savings lost due to non-compliance for a number of different product groups in EU countries, see: EEPliant3 (2018) https://eepliant.eu

4. Enforcement

Market surveillance and verification testing only deter non-compliance if the consequences of being caught are greater than the perceived benefits of circumventing the requirements. It is the role of the enforcement regime to protect the integrity of the MEPS and labelling scheme. While enforcement needs to be strong enough for genuine deterrence, it needs to be proportionate.

4.1 Degrees of non-conformity

There may be considerable differences in the degree of non-conformity with MEPS and energy labelling regulations. Potential forms of non-conformity are listed in Table 6.

Table 6: Potential forms of non-conformity

Where	Potential forms of non-compliance
At point of import/placing on the market	• Contravention of product registration procedures • Failure to provide conformity assessment report • Failure to provide requisite technical documentation • Failure to provide proof of testing • Failure to submit product for testing • Failure to cooperate with authorities • Falsification of test reports • Failure of product conform with MEPS requirements • Missing energy label or energy performance rating information • Inaccurate energy performance information or energy label • Smuggling products with intent to contravene regulations
At point of testing	• Failure to provide proof of testing • Failure to submit product for testing • Failure to meet performance claims or comply with MEPS • Failure to supply information to assist with testing (e.g. indicate where the product has been sold, where samples should be taken) • Falsification of test reports
At point of sale	• Missing energy label or energy performance rating information • Misuse of a voluntary or mandatory energy label • Inaccurate energy performance information or energy label • Failure to provide required energy performance or labelling class in product catalogues, websites or other promotional media • Failure to meet performance claims or comply with MEPS
Following initial enforcement action	• Failure to take corrective action following initial identification of non-conformity • Failure to follow a requisite procedure • Failure to pay testing fees • Failure to pay fines • Falsely arguing that the model was already discontinued • Any, or all, of the above as a repeat offence after ample notice of the infraction

The degree and severity of non-compliance can vary substantially as can the underlying reasons. Enforcement needs to be tailored to the situation and avoid disproportionate measures.

4.2 Actions in event of non-conformity

Enforcement authorities need flexibility in how they provide corrective action. Most follow a hierarchy of escalating actions as shown in Figure 5. While prosecution is the ultimate potential action, most enforcement is via softer measures. These begin with notifying a party that they are in contravention of the regulations and warning them to remedy the situation. Additional corrective actions may be mandated within a certain time period. Thereafter, the product may be removed from the market. If non-compliance is deemed to be intentional rather than a misunderstanding, further sanctions can be applied, encompassing anything from publicity of failure to comply, fines, suspension of operating license, and prosecution. Enforcement authorities will need to establish the procedures they will go through under each circumstance.

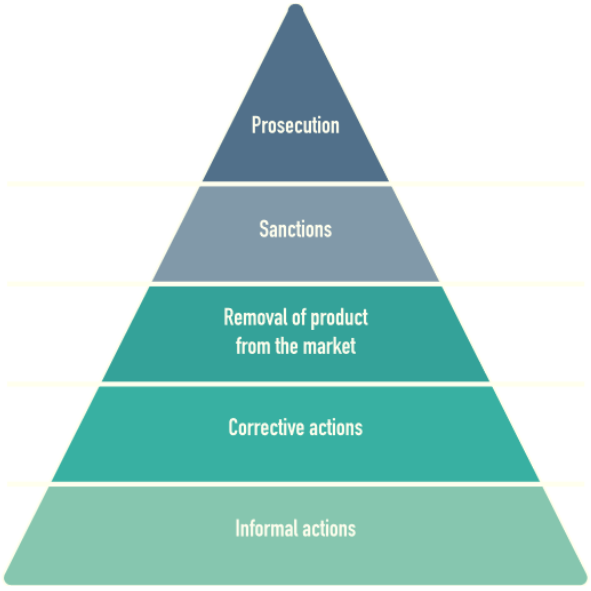


Figure 5: Pyramid of escalating enforcement[35]

An example from the Netherlands is shown for MEPS in Figure 6 and for energy labelling in Figure 7. In Figure 6 E_s is the product's energy performance value established through verification testing and E_{reg} is the maximum value permitted under the regulations. After many years of operating an enforcement regime that required the MSA to pursue non-compliant suppliers via prosecution in the courts, the laws have recently been changed to give the MSA the authority to determine non-compliance itself and follow enforcement actions without having to take malefactors to court. This change has been made because it is too costly and time consuming to pursue this kind of enforcement action through the courts.

[35] UNEP U4E (2016) *Enforcing Efficient Lighting Regulations*: https://united4efficiency.org/resources/enforcing-efficient-lighting-regulations/, see Implementing a National Enforcement Regime on page 27.

Figure 6: Ecodesign MEPS surveillance and enforcement flow chart in the Netherlands

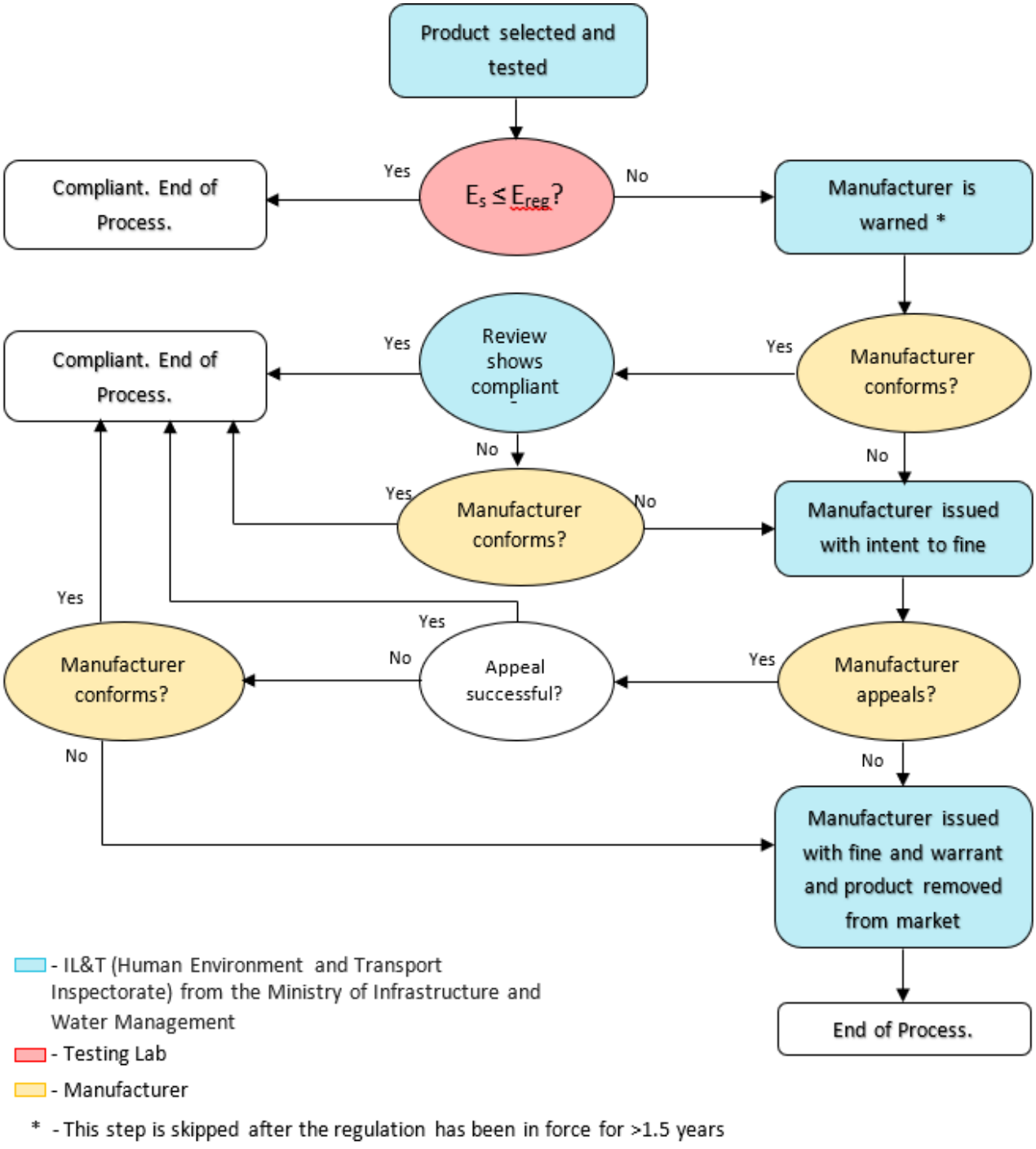
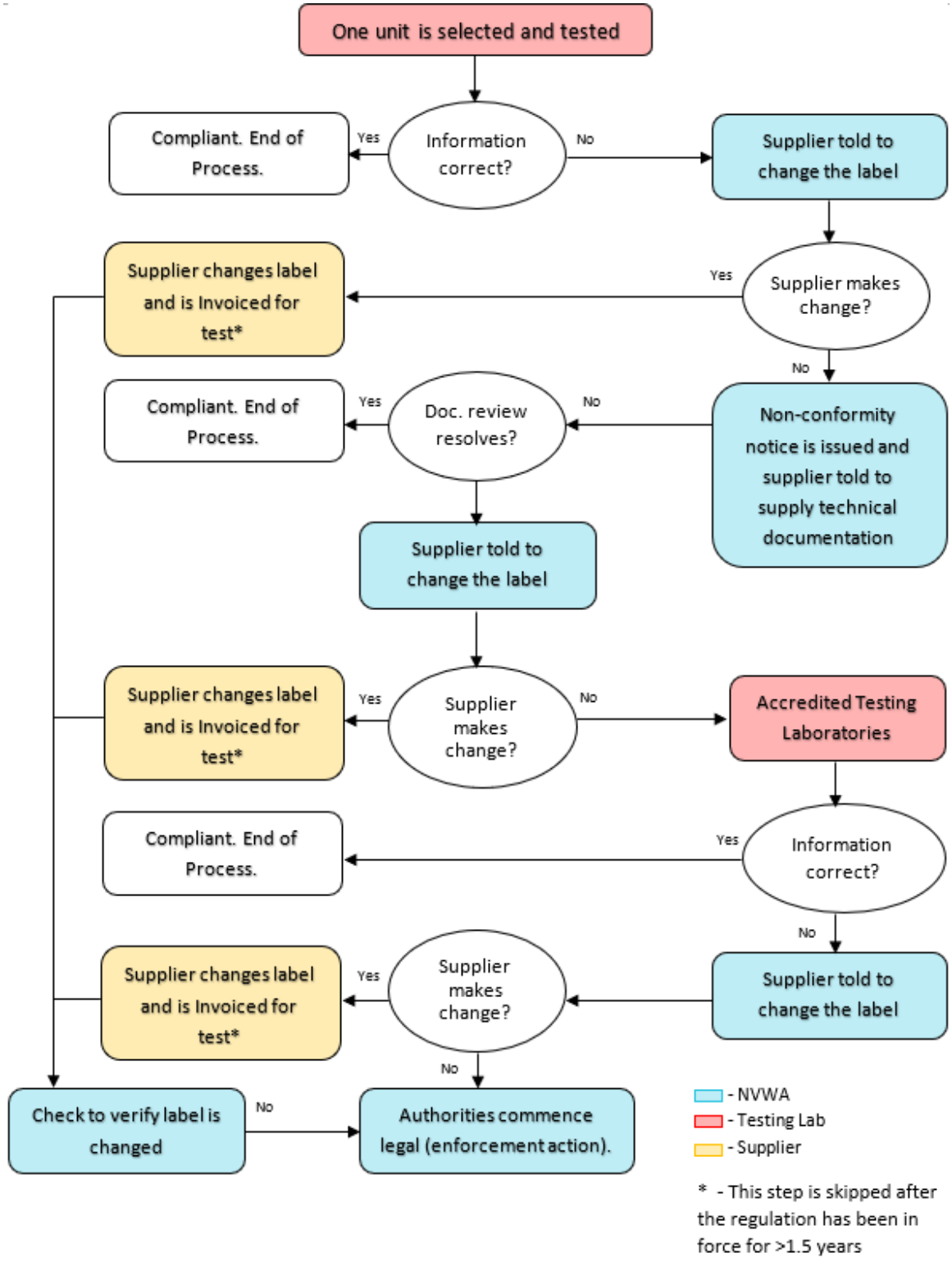


Figure 7: Energy labelling surveillance and enforcement flow chart in the Netherlands[36]



[36] NVWA is the Netherlands' Food and Product Safety Authority responsible for energy labelling market surveillance.

4.3 Penalties

Enforcement actions and penalties can include sanctions implemented outside of criminal hearings (i.e. out of court) and criminal proceedings involving prosecution and conviction if upheld in a court. Depending on the legal system, enforcement measures distinguish between civil law and criminal law pathways. The latter is reserved to prosecute and punish individuals, while the former is used to prosecute and punish a commercial entity. Use of criminal law is unusual for MEPS and energy labelling, but in cases where specific individuals can be shown to have wilfully broken the law and the scale of the crime is severe, it may be an option of last resort. The burden of proof and costs in criminal law are usually higher. Successful prosecution under civil law requires proof that a legal corporate entity contravened the law. In the case of MEPS and labelling, this can be established through conformity verification. This is generally easier to prove than criminal intent and hence is the ordinary pathway and endpoint for most serious non-conformity cases.

If they are to act as a genuine deterrent to non-conformity, MEPS and labelling enforcement must to be designed and implemented with sufficiently robust enforcement structures, resources, procedures and legal foundations capable of producing a successful conviction when non-compliance is detected. If prospective malefactors do not believe that their actions could result in a conviction, they are less likely to respect the requirements. Nonetheless, prosecution is the most severe, costly and time-consuming form of enforcement. In most cases, enforcement actions will be softer.

Penalties need to be appropriate to the gravity of non-compliance and likely intent. Most enforcement authorities begin by requesting corrective measures and potentially charging those found to be non-compliant for any verification testing costs incurred, per the case shown in Figure 7 for the Netherlands. Non-compliant products are invariably forbidden from sale on the market and must either be withdrawn from sale (if already on the market) or (if detected prior to being placed on the market) refused the right to be sold into the market. MSAs may also be empowered to seize and destroy non-compliant goods. This is usually highly effective but requires a right to appeal prior to it being carried out and should only be pursued if the producer cannot or is unlikely to perform corrective action, such as rectifying an energy label or changing a failing component.

Many countries also apply fines for non-compliant retailers. Some MEPS and labelling programmes suffer because of limited power to impose penalties. This can be due to the enabling legislation, which may have a broad mandate and not include penalty provisions. It is important that this be considered when the legislation is under development to ensure that penalties are in place that offer a sufficient deterrence to non-compliance.

4.4 Legal powers and processes

When establishing the requisite legal powers and processes, the first step is to assess existing legislation and administrative procedures to determine what extant legal powers and authorities exist to enforce similar regulations. If suitable existing frameworks exist, MEPS and labelling legislation can take advantage of these to speed up implementation and minimize costs.

Sometimes, however, it is necessary to start from the beginning and build the required legal powers, authorities, and mandates from the foundations up.

Comprehensive reviews of the legal powers and processes necessary to enforce MEPS and labelling are provided by UNEP U4E[37] and CLASP[38].

5. Conclusions

An effective compliance regime to ensure the integrity of MEPS and labelling programmes is the only way to ensure that the requirements are respected, intended policy objectives are achieved, and consumer and business interests are protected. A variety of international examples are available of how governments are successfully implementing compliance regimes, as well as lessons learned from those where critical challenges have arisen. There are differences in application across jurisdictions, with some emphasizing stringent upstream conformity assessment and market entry conditions while others place greater emphasize on downstream market surveillance and enforcement. A combination of approaches, leveraging these lessons learned, is recommended for those looking to update existing, or adopt new, compliance regimes.

[37] UNEP U4E (2016) *Enforcing Efficient Lighting Regulations*, Nicole Kearney, https://united4efficiency.org/resources/enforcing-efficient-lighting-regulations/

[38] CLASP (2010) *Compliance Counts: A Practitioner's Guidebook on Best Practice Monitoring, Verification, and Enforcement for Appliance Standards & Labelling*, https://clasp.ngo/publications/compliance-counts-a-practitioners-guidebook-on-best-practice-monitoring-verification-and-enforcement-for-appliance-standards-labeling

Annex A – Conformity Assessment Protocols for Refrigerators and Air Conditioners

This annex presents examples of conformity assessment protocols for refrigerators and air conditioners respectively, as cited in European Union regulations.

A1.1 An example conformity assessment protocol for refrigerators

An example of a conformity assessment protocol for refrigerators drawn from the EU Commission Regulation (EU) 2019/2019 of 1 October 2019 is given in the text below[39].

1. The conformity assessment procedure referred to in Article 8 of Directive 2009/125/EC shall be the internal design control system set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.

2. For the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation shall contain a copy of the product information provided in accordance with Point 4 of Annex II (see inset text below), and the details and the results of the calculations set out in Annex III to this Regulation.

4. Information requirements:

From 1 March 2021, instruction manuals for installers and end-users, and free access website of manufacturers, importers or authorised representatives shall include the following information:

(a) The combination of drawers, baskets and shelves that result in the most efficient use of energy for the refrigerating appliance;

(b) Clear guidance about where and how to store foodstuffs in a refrigerating appliance for best preservation over the longest period, to avoid food waste;

(c) The recommended setting of temperatures in each compartment for optimum food preservation. These settings shall not contradict the storage conditions set out in Annex III;

(d) An estimation of the impact of temperature settings on food waste;

(e) A description of the effects of special modes and features, and in particular how temperatures are affected in each compartment and for how long;

(f) For wine storage appliances: 'this appliance is intended to be used exclusively for the storage of wine'. This shall not apply to refrigerating appliances that are not specifically designed for wine storage but may be used for this purpose, or to refrigerating appliances that have a wine storage compartment combined with any other compartment type;

(g) Instructions for the correct installation and end-user maintenance, including cleaning, of the refrigerating appliance;

(h) For a freestanding appliance: 'this refrigerating appliance is not intended to be used as a built-in appliance';

(i) For appliances without a 4-star compartment: 'this refrigerating appliance is not suitable for freezing foodstuffs';

(j) Access to professional repair, such as internet webpages, addresses, contact details;

(k) Relevant information for ordering spare parts, directly or through other channels provided by the manufacturer, importer or authorised representative;

(l) The minimum period during which spare parts, necessary for the repair of the appliance, are available;

[39] EU Commission Regulation (EU) 2019/2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R2019#:~:text=Commission%20Regulation%20(EU)%202019%2F,(Text%20with%20EEA%20relevance.)

(m) The minimum duration of the guarantee of the refrigerating appliance offered by the manufacturer, importer or authorised representative;

(n) For refrigerating appliances with climate class:
- extended temperate: 'this refrigerating appliance is intended to be used at ambient temperatures ranging from 10 °C to 32 °C';
- temperate: 'this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 32 °C';
- subtropical: 'this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 38 °C';
- tropical: 'this refrigerating appliance is intended to be used at ambient temperatures ranging from 16 °C to 43 °C';

(o) Instruction on how to find the model information in the product database, as defined in Regulation (EU) 2019/2016 by means of a weblink that links to the model information as stored in the product database or a link to the product database and information on how to find the model identifier on the product.

ANNEX III Measurement methods and calculations

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards, or other reliable, accurate and reproducible methods, which takes into account the generally recognised state-of-the-art methods and are in line with the provisions set out below.

The reference numbers of these harmonised standards have been published for this purpose in the Official Journal of the European Union:

1. General conditions for testing:

(a) For refrigerating appliances with anti-condensation heaters that can be switched on and off by the end-user, the anticondensation heaters shall be switched on and — if adjustable — set at maximum heating and included in the annual energy consumption (AE) as daily energy consumption (Edaily);

(b) For refrigerating appliances with ambient controlled anti-condensation heaters, the ambient controlled electric anticondensation heaters shall be switched off or otherwise disabled, where possible, during the measurement of energy consumption;

(c) For refrigerating appliances with dispensers that can be switched on and off by the end-user, the dispensers shall be switched on during the energy consumption test but not operating;

(d) For the measurement of energy consumption, variable temperature compartments shall operate at the lowest temperature that can be set by the end-user to continuously maintain the temperature range, as set out in Table 3, of the compartment type which has the lowest temperature;

(e) For refrigerating appliances that can be connected to a network, the communication module shall be activated but there is no need to have a specific type of communication or data exchange or both during the energy consumption test. During the energy consumption test it has to be ensured that the unit is connected to a network;

(f) For the performance of chill compartments:
- For a variable temperature compartment rated as a fresh food and/or chill compartment, the energy efficiency index (EEI) shall be determined for each temperature condition and the highest value shall be applied;
- A chill compartment shall be able to control its average temperature within a certain range without user-adjustments of its control, this can be verified during the energy consumption tests at 16 °C and 32 °C ambient temperature;

(g) For adjustable volume compartments, when the volumes of two compartments are adjustable relative to one another by the end-user, the energy consumption and the volume shall be tested when the volume of the compartment with the higher target temperature is adjusted to its minimum volume;

(h) The specific freezing capacity is calculated as 12 times the light load weight, divided by the freezing time to bring the temperature of the light load from +25 to -18 °C at an ambient temperature of 25 °C expressed in kg/12 h and rounded to one decimal place; the light load weight is 3,5 kg per 100 litre of the compartment volume of the frozen compartments, and shall be at least 2,0 kg;

(i) For the determination of the climate classes, the acronym for the ambient temperature range, that is SN, N, ST or T:

1) the extended temperate (SN) has a temperature range from 10 °C to 32 °C;

2) the temperate (N) has a temperature range from 16 °C to 32 °C;

3) the subtropical (ST) has a temperature range from 16 °C to 38 °C; and

4) the tropical (T) has a temperature range from 16 °C to 43 °C.

[Note: text continues in the EU legislation, which is truncated here as an example]

3. Where the information included in the technical documentation for a particular model has been obtained:

(a) From a model that has the same technical characteristics relevant for the technical information to be provided but is produced by a different manufacturer, or

(b) By calculation on the basis of design or extrapolation from another model of the same or a different manufacturer, or both, the technical documentation shall include the details of such calculation, the assessment undertaken by the manufacturer to verify the accuracy of the calculation and, where appropriate, the declaration of identity between the models of different manufacturers.

The technical documentation shall include a list of all equivalent models, including the model identifiers.

4. The technical documentation shall include the information in the order and as set out in Annex VI of Regulation (EU) 2019/2016. For market surveillance purposes, manufacturers, importers or authorised representatives may, without prejudice to Annex IV, point 2(g) of Directive 2009/125/EC, refer to the technical documentation uploaded to the product database which contains the same information laid down in Regulation (EU) 2019/2016.

ANNEX IV: Internal design control (referred to in Article 8(2))

1. This Annex describes the procedure whereby the manufacturer or its authorised representative who carries out the obligations laid down in point 2 ensures and declares that the product satisfies the relevant requirements of the applicable implementing measure. The EC declaration of conformity may cover one or more products and must be kept by the manufacturer.
2. A technical documentation file making possible an assessment of the conformity of the product with the requirements of the applicable implementing measure must be compiled by the manufacturer.

The documentation must contain, in particular:

(a) A general description of the product and of its intended use;

(b) The results of relevant environmental assessment studies carried out by the manufacturer, and/or references to environmental assessment literature or case studies, which are used by the manufacturer in evaluating, documenting and determining product design solutions;

(c) The ecological profile, where required by the implementing measure;

(d) Elements of the product design specification relating to environmental design aspects of the product;

(e) A list of the appropriate standards referred to in Article 10, applied in full or in part, and a description of **the solutions adopted to meet the requirements of the applicable implementing measure where the standards referred to in Article 10 have not been applied or where those standards do not cover entirely the requirements of the applicable implementing measure;**

(f) A copy of the information concerning the environmental design aspects of the product provided in accordance with the requirements specified in Annex I, Part 2; and

(g) The results of measurements on the ecodesign requirements carried out, including details of the conformity of these measurements as compared with the ecodesign requirements set out in the applicable implementing measure.

3. The manufacturer must take all measures necessary to ensure that the product is manufactured in compliance with the design specifications referred to in point 2 and with the requirements of the measure which apply to it.

ANNEX V Management system for assessing conformity (referred to in Article 8(2))

1. This Annex describes the procedure whereby the manufacturer who satisfies the obligations of point 2 ensures and declares that the product satisfies the requirements of the applicable implementing measure. The EC declaration of conformity may cover one or more products and must be kept by the manufacturer.
2. A management system may be used for the conformity assessment of a product provided that the manufacturer implements the environmental elements specified in point 3.
3. Environmental elements of the management system. This point specifies the elements of a management system and the procedures by which the manufacturer can demonstrate that the product complies with the requirements of the applicable implementing measure.

   3.1 The environmental product performance policy

   The manufacturer must be able to demonstrate conformity with the requirements of the applicable implementing measure. The manufacturer must also be able to provide a framework for setting and reviewing environmental product performance objectives and indicators with a view to improving the overall environmental product performance.

   All the measures adopted by the manufacturer to improve the overall environmental performance of, and to establish the ecological profile of, a product, if required by the implementing measure, through design and manufacturing, must be documented in a systematic and orderly manner in the form of written procedures and instructions.

   These procedures and instructions must contain, in particular, an adequate description of:

   (a) The list of documents that must be prepared to demonstrate the product's conformity, and, if relevant, that have to be made available;

   (b) The environmental product performance objectives and indicators and the organisational structure, responsibilities, powers of the management and the allocation of resources with regard to their implementation and maintenance;

   (c) The checks and tests to be carried out after manufacture to verify product performance against environmental performance indicators;

   (d) The procedures for controlling the required documentation and ensuring that it is kept up-to-date; and

   (e) The method of verifying the implementation and effectiveness of the environmental elements of the management system.

3.2. Planning

The manufacturer must establish and maintain:

(a) Procedures for establishing the ecological profile of the product;

(b) Environmental product performance objectives and indicators, which consider technological options, taking into account technical and economic requirements; and

(c) A programme for achieving these objectives.

3.3. Implementation and documentation

3.3.1. The documentation concerning the management system must, in particular, comply with the following:

(a) Responsibilities and authorities must be defined and documented in order to ensure effective environmental product performance and reporting on its operation for review and improvement;

(b) Documents must be established indicating the design control and verification techniques implemented and processes and systematic measures used when designing the product; and

(c) The manufacturer must establish and maintain information to describe the core environmental elements of the management system and the procedures for controlling all documents required.

3.3.2. The documentation concerning the product must contain, in particular:

(a) A general description of the product and of its intended use;

(b) The results of relevant environmental assessment studies carried out by the manufacturer, and/or references to environmental assessment literature or case studies, which are used by the manufacturer in evaluating, documenting and determining product design solutions;

(c) The ecological profile, where required by the implementing measure;

(d) Documents describing the results of measurements on the ecodesign requirements carried out including details of the conformity of these measurements as compared with the ecodesign requirements set out in the applicable implementing measure;

(e) The manufacturer must establish specifications indicating, in particular, standards which have been applied; where standards referred to in Article 10 are not applied or where they do not cover entirely the requirements of the relevant implementing measure, the means used to ensure compliance; and

(f) Copy of the information concerning the environmental design aspects of the product provided in accordance with the requirements specified in Annex I, Part 2.

3.4. Checking and corrective action

3.4.1. The manufacturer must:

(a) Take all measures necessary to ensure that the product is manufactured in compliance with its design specification and with the requirements of the implementing measure which applies to it;

(b) Establish and maintain procedures to investigate and respond to non-conformity, and implement changes in the documented procedures resulting from corrective action; and

(c) Carry out at least every three years a full internal audit of the management system with regard to its environmental elements.

ANNEX VI

EC declaration of conformity (referred to in Article 5(3))

The EC declaration of conformity must contain the following elements:

1. The name and address of the manufacturer or of its authorised representative;
2. A description of the model sufficient for its unambiguous identification;
3. Where appropriate, the references of the harmonised standards applied;

4. Where appropriate, the other technical standards and specifications used;
5. Where appropriate, the reference to other Community legislation providing for the affixing of the CE mark that is applied; and
6. The identification and signature of the person empowered to bind the manufacturer or its authorised representative.

A1.2 An example conformity assessment protocol for air conditioners

An example of a conformity assessment protocol for air conditioners from the EU Ecodesign regulation No 206/2012 of 6 March 2012[40] is given in the text below.

1. The conformity assessment procedure referred to in Article 8 of Directive 2009/125/EC shall be the internal design control set out in Annex IV to that Directive or the management system set out in Annex V to that Directive. *(See Annex IV and V in the refrigerator example above)*

2. For the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation file shall contain the results of the calculation set out in Annex II to this Regulation.

ANNEX II Measurement methods and calculations

1. For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published in the Official Journal of European Union, or other reliable, accurate and reproducible method, which takes into account the generally recognised state of the art methods, and whose results are deemed to be of low uncertainty. They shall fulfil all of the following technical parameters.
2. The determination of the seasonal energy consumption and efficiency for seasonal energy efficiency ratio (SEER) and seasonal coefficient of performance (SCOP) shall take into account:
   (a) European cooling and heating season(s), as defined in Table A1.2.1;
   (b) Reference design conditions, as defined in Table A1.2.2;
   (c) Electric energy consumption for all relevant modes of operation, using time periods as defined in Table A1.2.4;
   (d) Effects of the degradation of the energy efficiency caused by on/off cycling (if applicable) depending on the type of control of the cooling and/or heating capacity;
   (e) Corrections on the seasonal coefficients of performance in conditions where the heating load cannot be met by the heating capacity;
   (f) The contribution of a back-up heater (if applicable) in the calculation of the seasonal efficiency of a unit in heating mode.
3. Where the information relating to a specific model, being a combination of indoor and outdoor unit(s), has been obtained by calculation on the basis of design, and/or extrapolation from other combinations, the documentation should include details of such calculations and/or extrapolations, and of tests undertaken to verify the accuracy of the calculations undertaken (including details of the mathematical model for calculating performance of such combinations, and of measurements taken to verify this model).
4. The rated energy efficiency ratio (EER_{rated}) and, when applicable, rated coefficient of performance (COP_{rated}) for single and double duct air conditioners shall be established at the standard rating conditions as defined in Table 2.
5. The calculation of seasonal electricity consumption for cooling (and/or heating) shall take into account

[40] EU (2012) European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:072:0007:0027:en:PDF#:~:text=matter%20and%20scope-,1.,fan%20power%20input%20%E2%89%A4%20125W.

electric energy consumption of all relevant modes of operation, as defined in Table A1.2.3, using operational hours, as defined in Table A1.2.4.

6. The comfort fan efficiency shall be determined on the basis of the nominal air flow rate of the unit divided by the nominal electric power input of the unit.

Table A1.2.1 Cooling and heating season bins (j = bin index, Tj = outdoor temperature, hj = hours per annum per bin) where ·db· = dry bulb temperature

Cooling season		
j #	Tj °C db	hj h/annum
1	17	205
2	18	227
3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0
Total h.		2602

Heating season				
j #	Tj °C db	hj h/annum		
		Average	Warmer	Colder
1 to 8	– 30 to – 23	0	0	0
9	–22	0	0	1
10	–21	0	0	6
11	–20	0	0	13
12	–19	0	0	17
13	–18	0	0	19
14	–17	0	0	26
15	–16	0	0	39
16	–15	0	0	41
17	–14	0	0	35
18	–13	0	0	52
19	–12	0	0	37
20	–11	0	0	41
21	–10	1	0	43
22	–9	25	0	54
23	–8	23	0	90
24	–7	24	0	125
25	–6	27	0	169
26	–5	68	0	195
27	–4	91	0	278
28	–3	89	0	306
29	–2	165	0	454
30	–1	173	0	385
31	0	240	0	490
32	1	280	0	533
33	2	320	3	380
34	3	357	22	228
35	4	356	63	261
36	5	303	63	279
37	6	330	175	229
38	7	326	162	269
39	8	348	259	233
40	9	335	360	230
41	10	315	428	243
42	11	215	430	191
43	12	169	503	146
44	13	151	444	150
45	14	105	384	97
46	15	74	294	61
Total h.		4 910	3 590	6 446

Table A1.2.2 Standard rating conditions, temperatures in dry-bulb air temperature (·wet bulb· indicated in brackets)

Appliance	Function	Indoor air temperature (°C)	Outdoor air temperature (°C)
Air conditioners, excluding single duct air conditioners	cooling	27 (19)	35 (24)
	heating	20 (max. 15)	7(6)
Single duct air conditioner	cooling	35 (24)	35 (24) [1]
	heating	20 (12)	20 (12) [1]

Table A1.2.3 Reference design conditions, temperatures in dry-bulb air temperature (wet- bulb indicated in brackets)

Function/season	Indoor air temperature (°C)	Outdoor air temperature (°C)	Bivalent temperature (°C)	Operating limit temperature (°C)
	Tin	**Tdesignc/Tdesignh**	**Tbiv**	**Tol**
Cooling	27 (19)	Tdesignc = 35 (24)	n.a.	n.a.
Heating/Average	20 (15)	Tdesignh = – 10 (– 11)	max. 2	max. – 7
Heating/Warmer		Tdesignh = 2 (1)	max. 7	max. 2
Heating/Colder		Tdesignh = – 22 (– 23)	max. – 7	max. – 15

Table A1.2.4 Operational hours per type of appliance per functional mode used for calculation of electricity consumption

Type of appliance / functionality		Unit	Heating season	On mode	Thermostat-off mode	Standby mode	Off mode	Crankcase heater mode
				cooling: H_{CE} heating: H_{HE}	**H_{TO}**	**H_{SB}**	**H_{OFF}**	**H_{CK}**
Air conditioners, except single and double duct air conditioner								
Cooling mode, if appliance offers cooling only		h/annum		350	221	2 142	5 088	7 760
Cooling and heating modes, if appliance offers both modes	Cooling mode	h/annum		350	221	2 142	0	2 672
	Heating mode	h/annum	Average	1 400	179	0	0	179
			Warmer	1 400	755	0	0	755
			Colder	2 100	131	0	0	131
Heating mode, if appliance offers heating only		h/annum	h/annum	1 400	179	0	3 672	3 851
			Warmer	1 400	755	0	4 345	4 476
			Colder	2 100	131	0	2 189	2 944
Double duct air conditioner								
Cooling mode, if appliance offers cooling only		h/60 min		1	n/a	n/a	n/a	n/a
Cooling and heating modes, if appliance offers both modes	Cooling mode	h/60 min		1	n/a	n/a	n/a	n/a
	Heating mode	h/60 min		1	n/a	n/a	n/a	n/a
Heating mode, if appliance offers heating only		h/60 min		1	n/a	n/a	n/a	n/a
Single duct air conditioner								
Cooling mode		h/60 min		1	n/a	n/a	n/a	n/a
Heating mode		h/60 min		1	n/a	n/a	n/a	n/a

[1] In the case of single duct air conditioners the condenser (evaporator) when cooling (heating) is not supplied with outdoor air, but indoor air.

Annex B – Description of the Equipment to be Acquired to Test Refrigerators and Air Conditioners

This annex describes the equipment required to test four refrigerators or four air conditioners simultaneously for the purposes of energy performance conformity assessment or verification testing.

B2.1 Equipment needs for testing refrigerators

The equipment required to set up a laboratory performance testing unit is shown in Table B2.1.1

Table B2.1.1: Refrigerator test equipment and their function

Qty	Equipment	Function
1	Test chamber	Shelter the refrigerator test chambers
1	Data acquisition system	Collect data from tested refrigerators as an interface to send to the hard disk
1	Digital wattmeter	To measure the instantaneous power demand of refrigerators
10	Thermocouples	Measure temperatures at different points inside refrigerators
1	Thermocouple connection panels	Connect the thermocouples on the same panel to collect the measured temperature data
1	Electrical outlet	Connect refrigerators to the voltage source
1	Hard disk drive	Store collected evaluation data
1	Printer	Put digital data on physical media
1	Copper cylinder	Add thermal mass to the temperature sensor to minimize fluctuations during measurements
1	Regulator	Ensure continuity of energy supply in the event of a power failure
1	Air conditioner	Check the temperature and humidity of the test chamber
1	Electrical system	Provide stable power to the enclosure and ensure continuity of power supply
1	Software	Acquire and help analyse data

The specifications of the equipment to be acquired for a laboratory that will be able to test four refrigerators simultaneously are shown in Table B2.1.2

Table B2.1.2: Technical specifications of the equipment to be purchased[41]

Item No.	Short description	Quantity	Unit of measurement (as applicable)
Refrigerator performance test laboratory (four stations)			
A	**Laboratory enclosure, 6000*4000*3,300**		
1	Panel (wall, roof): 100 mm polyurethane panel sandwiched between two panels.	80	m^2
2	Floor: 2.5 mm stainless steel + 100 mm polyurethane sandwich panel	20	m^2
3	Door: 1200 X 2000	1	
4	Window	1	
5	Framework	1	
6	Perforated ceiling	20	m^2
7	Other parts of the enclosure	1	patch
8	Lamps: 2*40 W	4	
9	Test platform	4	
B	**Air treatment unit**		
1	Air conditioner: stainless steel	1	
2	Evaporator: 9 KW	2	
3	Air compressor: 12 KW	2	
4	Copper tube and insulation tube	2	
5	Humidifier: Stainless Steel	2	
6	Hot battery: 1.5 kW	12	room
7	Humidifier heater: 7.5 kW	2	room
8	Ventilator	2	
9	Converter: FR-E740	1	
C	**Electrical system**		
1	UT55A temperature monitor	2	
2	Psychrometer R221-30, including 2 RTDs	1	
3	Electricity regulator SAM40100D	2	
4	Control and test panel	1	
5	Electrical conductors and cables	1	
6	Metal electrical wire conduits	1	
7	Low-voltage electrical equipment	1	
D	**Measuring system**		
1	PC- P4/2G: 1T hard disk drive	1	
2	Colour printer: LaserJet 1215	1	
3	Data acquisition system: DA100.80 CH	1	
4	Digital wattmeter: WT210	4	
5	Converter and regulator: 500W	1	
6	Thermocouple: Type T, 0.3mm2	2000	m
7	Electrical outlet	4	
8	Thermocouple interface panel, 20 points	2	
9	Programmable Logic Controller -PLC, FX-2N	1	
10	Human machine interface (HMI), 10.4".	1	
11	Copper cylinder (weight 25g, diameter and height 15.2 mm)	60	
E	**Accompanying software**		
1	Accompanying software	1	

[41] Illustrative example adapted from a tender being conducted by a government as of the writing of this report.

B2.2 Equipment needs for testing room air conditioners

The equipment required to set up a laboratory performance testing unit for room air conditioners is shown in Table B2.2.1. There are different methods to test the energy consumption of air conditioners, Table B2.2.1 shows the calorimetric and psychrometric methods. Note, that most programmes will use calorimetric test chambers to test room air conditioners as these are cheaper and are the faster test method; however, information on the alternative psychrometric test chambers which use the air enthalpy method is also presented for completeness. The latter allow for more accurate test results and are often used to calibrate calorimetric test chambers.

Table B2.2.1: Test equipment for air conditioners

Item No.	Description	Equipment	Standard
1	Calorimetric chamber with two chambers	Equipment used to test the capacities of the four primary types of room air conditioner	ISO 5151
2	Wattmeter	Instrument for measuring the electrical properties of the device throughout the function test	N/A
3	Psychrometric chamber	Same test principle as for the calorimeter chamber but using the enthalpy of air method to measure the variables	ISO 5151

The information to be provided by the test devices is mainly the following:

- The date and time the results were saved.
- The atmospheric pressure, temperature and humidity of the test chamber, as well as all their variations during the test.
- The electrical characteristics imposed on the appliances.

Table B2.2.2 summarizes the technical specifications of the equipment to be acquired for air conditioner room testing under either the calorimetric or psychrometric test method.

Table B2.2.2: Technical specifications of the air conditioner test equipment[42]

Qty	Device	Description	Specifications
1	Calorimeter chamber	Allows evaluation of the cooling performance of air conditioners	• ISO 5151 certified • Able to test window, split and cabinet types • Repeatability of results ±1 per cent • Accuracy ± 3 percent. • Temperature from 0 to 70°C • Thermal stability ± 1 °C • Automatic test sequence • Automatic saving of results • Easy access to results for printing • Simple test monitoring
1	Wattmeter (power meter)	Measures the electrical power of the devices	• Accuracy class 1 • Operates in DC and AC up to 500V • Supports power up to 5000W • Displays minimally: voltage, current, power, frequency, power factor • Expandable non-volatile memory
1	Psychro-metric chamber	Measures the cooling and electrical performance of air conditioners	• ISO 5151 certified • Able to test window, split and cabinet types • Repeatability of results ±1 percent. • Accuracy ± 3 percent. • Temperature from 0 to 70°C • Thermal stability ± 1 °C • Automatic test sequence • Automatic saving of results • Easy access to results for printing • Integrated AC and DC wattmeter up to 500V • Built-in wattmeter supporting 5000W • Minimally displays voltage, current, power, frequency and power factor • Simple test monitoring

[42] Illustrative example adapted from a tender being conducted by a government as of the writing of this report.

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