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MARKET SURVEILLANCE AND THE ECODESIGN DIRECTIVE – NORDIC EXPERIENCES

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Abstract: The Ecodesign Directive (2009/125/EC) and its successor, the Ecodesign for Sustainable Products Regulation, play important roles in ensuring more sustainable products. The Ecodesign Directive has proven effective in reducing energy consumption and CO₂ emissions. A key aspect in ensuring the full potential of the Directive is that regulations are enforced by the authorities, which renders market surveillance imperative. 10-20% of the products entering the European market are not in compliance with the ecodesign requirements. In this article, we analyse the challenges of market surveillance focusing on three Nordic countries, by answering the research question: *How are the material efficiency requirements within the Ecodesign Directive verified through market surveillance and what are the challenges and potentials of the current approach?* Our results show that the current experiences with market surveillance of the adopted material efficiency requirements are limited and that there are significant synergetic effects related to effective market surveillance.

1. INTRODUCTION

The Ecodesign Directive (2009/125/EC), which establishes a framework for setting ecodesign requirements for energy-related products, is in the Circular Economy Action Plan from 2020 highlighted as playing an important role in ensuring more sustainable products and delivering on circularity [1]. The Ecodesign Directive has in combination with the Energy Labelling proven effective in reducing energy consumption and CO₂ emissions. The combined ecodesign and labelling measures have by 2020 saved 10% of primary energy consumption and 10% of CO₂-eq. greenhouse gas emissions compared to a business-as-usual scenario (EU27), and these numbers are expected to increase to 18% by 2030 [2].

Since its first adoption in 2005, the Directive has undergone quite a development. In its early years, the Ecodesign Directive was criticized for a unilateral focus on energy consumption in the use phase [3, pp. 1098–1105], [4]. Since the revision of the Directive in 2009, the Ecodesign implementing measures have gradually focused more on material efficiency requirements beginning with the research programme REAPro (Resource Efficiency Assessment of Products) [5, pp. 137–142]. The first comprehensive material efficiency requirements were, however, not adopted until 2019 [5, pp. 137–142]. The latest

development is the Proposal for Ecodesign for Sustainable Products Regulation, which was published in March 2022. Some of the new elements in the proposal are that all products are covered, with a few exemptions, and that it is possible to set up much more comprehensive requirements to for instance product durability and reliability, product reusability, product upgradability, reparability, maintenance and refurbishment, the presence of substances of concern in products, product energy and resource efficiency, recycled content in products, product remanufacturing and recycling, products' carbon and environmental footprints and products' expected generation of waste materials [6]. In addition, the new proposal is a Regulation, implying that it will be directly binding for the member states in contrast to the existing Directive, which is implemented into the national legislations of the Member States [6]. With this change, the likelihood of national differences in the management of the regulation is lowered.

Given the savings in energy consumption and reductions in CO₂ emissions, the Directive, and the proposed Regulation on ecodesign for sustainable products do have a significant potential for achieving important results on material efficiency as well. A key aspect in ensuring the full potential of the Directive is that the implementing measures are enforced by the authorities, which renders market surveillance

imperative. However, according to a conclusion by the Commission from 2015, most member states have a low level of market surveillance, and the Commission acknowledges the need for increasing the cooperation [7, pp. 1–41]. In addition, 10-20% of the products entering the European market are not in compliance with the ecodesign requirements [8, pp. 1819–1830], implying that 10% of the total energy savings are lost [9, pp. 1–43]. Furthermore, given that studies have shown that primarily energy requirements are tested during control measurements [10], and the proposal on Ecodesign for Sustainable Products Regulation emphasises requirements that supports material efficiency and the circular economy, it might be time to rethink the current market surveillance procedures and ensure an effective market surveillance of material efficiency requirements as well. In this article, we will analyse the challenges of the market surveillance of material efficiency requirements, by answering the research question:

How are the material efficiency requirements within the Ecodesign Directive verified through market surveillance and what are the challenges and potentials of the current approach?

The research focuses particularly on the approach of the three Nordic countries Denmark, Sweden, and Norway, as these are some of the countries in the EU and European Economic Area (EEA) dedicating most resources to market surveillance [10], [11].

2. METHODS

This study was conducted based on a desktop study of requirements to the market surveillance of the Ecodesign Directive, and interviews with the responsible Market Surveillance Authorities in Denmark, Norway, and Sweden. An overview of the conducted interviews is shown in Table 1. The Norwegian Market Surveillance Authorities are included in the study even though Norway is not part of the EU, because the Ecodesign Directive is also implemented in the Norwegian legislation and Norway fits the criteria of being one of the countries in the EEA allocating most resources to the market surveillance thereof.

Table 1: Overview of interviews conducted for the study

Interviewee	Date of interview
Technical Advisor from Danish Safety Technology Authority	1 December 2020
Four representatives from The Norwegian Water	17 December 2020

Resources and Energy Directorate	
Representative from the Swedish Energy Agency	19 January 2021

3. THE ECODESIGN DIRECTIVE AND MARKET SURVEILLANCE

The Ecodesign Directive is one of several EU policy instruments aimed at driving the market towards sustainability. Since it is a framework directive, the product specific requirements are set up in implementing measures, which can be regulations or voluntary agreements. Working plans determine the lists of products to be prioritized for implementing measures and the criteria for determining the product groups' eligibility are for instance sales volumes and that the products should have a significant environmental impact and improvement potential [12].

The working plans and later the preparatory studies for the product specific implementing measures are developed in accordance with the underlying methodology for the Ecodesign of Energy-related Products (MEErP). Being a so-called New Approach directive, manufacturers, and importers of products to the European market covered by the Ecodesign Directive must, according to Article 4 and 5 of the Directive, keep and make available a declaration of conformity [12]. Here harmonised standards play a key role in showing compliance with the legislation [13], [14]. Specifically, the harmonised standards specify the measurements methods that should be applied to show compliance with the technical requirements that are listed in the implementing measures [15].

3.1. The market surveillance

Member States are obliged to appoint authorities responsible for the market surveillance [12]. Their responsibilities are [12], Article 3:

- a) *organise appropriate checks on product compliance, on an adequate scale, and oblige the manufacturer or its authorised representative to recall non-compliant products from the market in accordance with Article 7;*
- b) *require the parties concerned to provide all necessary information, as specified in the implementing measures;*
- c) *take samples of products and subject them to compliance checks.*

The market surveillance authorities shall inform the Commission of the results of the market surveillance, and where relevant, the information must

be passed on to other Member States [12]. According to Regulation 2019/1020 on market surveillance and compliance of products, the market surveillance can consist of documentary checks and where appropriate physical and laboratory checks [16]. The market surveillance must be conducted on an adequate scale, and to ensure effective market surveillance, the market surveillance authorities should prioritise their resources and actions [16].

3.1.1. Status on the market surveillance

In 2014, the Member States reported to the European Commission about their market surveillance activities in the period 2009-2013. Based on these reports, the Commission concluded that in 2009-2010 approximately one third of the member states conducted few or no market surveillance activities in relation to the Energy Labelling and the Ecodesign Directive [17, pp. 1–7]. The number of yearly inspected products ranges from 20 to 100.000 per Member State [7, pp. 1–41]. However, these numbers cover a broad range of market surveillance activities, from visual inspections in a shop or online, to document checks to laboratory tests, and therefore the numbers are not easily interpreted [7, pp. 1–41].

To support the market surveillance, the Commission has inter alia funded ten projects in the period 2009 to 2018 through the Horizon 2020 and Intelligent Energy Europe programmes, aimed at improving the market surveillance activities within the Ecodesign Directive and Energy labelling Regulation [7, pp. 1–41]. The three Energy Efficiency Compliant Products (EEPLIANT) projects are examples of such projects. The first EEPLIANT project ran from 2015 to 2017 and focused on the product groups: LED lamps, imaging equipment, and space heaters and combination heaters [18]. The second EEPLIANT project ran from 2017 to 2020 and focused on the product groups household refrigerating appliances, professional refrigeration products, and on the horizontal regulation on network standby [19]. The third EEPLIANT project began its activities in 2019 and run until November 2023 [20]. The focus of the ongoing EEPLIANT project is air conditioners and comfort fans, household tumble dryers, water heaters and hot water storage tanks, ventilation units, lighting products, and local space heaters [20]. One of the outcomes of the first EEPLIANT project is a best practise guide on among other things how to set up national market surveillance and inspection programmes, how to select products for inspection, including risk assessment, how to conduct document inspection, how to conduct compliance verification laboratory tests and the sharing of inspection results [18].

While these projects are considered a success and have financed tests that market surveillance

authorities would not otherwise have conducted, the European Court of Auditors also concluded that due to the continuity of the programmes there is a risk of the market surveillance authorities relying on EU funding for fulfilling their responsibilities on market surveillance [7, pp. 1–41]. The conclusion therefore was that the market surveillance authorities had not changed or improved their activities, due to their participation in the projects [7, pp. 1–41].

3.1.3. The ICSMS and EPPREL Databases

To support the market surveillance of the Ecodesign Directive and the Energy labelling Regulation, the Commission had the European Product Database for Energy Labelling (EPREL) developed and make use of the Information and Communication System on Market Surveillance (ICSMS) database. EPREL is a database, where suppliers must, before entering the EU market, register their products, which are required to carry the Energy label [21]. The registration of products has been a requirement since 1 January 2019, and since May 2022, the database has been open for public access [21]. From a market surveillance perspective, the EPREL database is useful for the market surveillance authorities to find product technical information provided by the manufacturers [11, pp. 1–41]. The ICSMS is specifically targeted market surveillance for a range of different legislations and support the market surveillance authorities to [22]:

- *exchange information on market surveillance measures quickly and efficiently*
- *coordinate activities and inspections more effectively*
- *share resources and test products which have yet to be tested*
- *carry out wide-scale market interventions on dubious products using the latest information to avoid duplicate inspections*
- *develop best practices*
- *ensure that market surveillance is efficient and uniform across all EU countries to prevent the distortion of competition*
- *establish an encyclopaedia of EU market surveillance intelligence*

The ICSMS includes an internal module targeted market surveillance, but it also includes a public module for consumers, users, and manufacturers. The latter only includes information on the product and its non-compliance, leaving for instance all internal documentation and correspondence between manufacturers and authorities on the internal module [22].

3.2. The role of standards in the market surveillance

Standards play a key role in market surveillance, as the Ecodesign Directive is covered by the New Approach. Here, standards are used to show compliance with the regulation and gain access to the European Market [14], [13]. In the context of the Ecodesign Directive, the standards specify the measurement methods that should be used to ensure compliance with requirements specified in the implementing measures [15]. To support the material efficiency requirements in the Ecodesign Directive and the market surveillance of these type of requirements; the European Commission issued a standardization request (M/543) in 2015. M/543 should specify parameters to be evaluated along with calculation and test methods, and it should cover aspects such as product lifetime extension, the reuse of components and/ or recycled materials and the ability to reuse components or recycled materials [23]. The M/543 resulted in the development of the EN4555X series of standards covering eight standards and one technical report [24]. The EN4555X series of standards are horizontal standards covering aspects such as durability, repair, reuse, upgrade, remanufacturing, reuse of components, recycled material, critical materials, definitions related to material efficiency and information relating to material efficiency [24]. As the standards are horizontal, product specific standards must be developed. This process has already started, and reference has been made to the EN4555x-series of standards in the implementing measure for servers and data storage products and the preparatory study for mobile phones, smartphones, and tablet [24].

4. NORDIC EXPERIENCES

The organisational setup of the market surveillance in the three countries (Denmark, Sweden, and Norway) is, as could be expected, different, the most remarkable difference being the number of employees assigned to market surveillance activities.

In Denmark, market surveillance activities concerning technical safety, which also includes the Ecodesign Directive and Ecolabelling, has been the responsibility of the Danish Safety Technology Authority since 2018 [25]. The market surveillance activities are spread across two departments, one focusing on product testing, and another department focusing on website and store inspections [11]. The latter mainly focusing on the Energy labelling [11]. The technical advisor at the Danish Safety Technology Authority estimates that 1.5 man-years are assigned to document control and product testing, whereas it is more difficult to assess how many man-years are allocated to the control of web shops, because typically more than one policy area is addressed [11].

In Norway, it is The Norwegian Water Resources and Energy Directorate that is responsible for the market surveillance regarding ecodesign, energy labelling and buildings [26]. Approximately 3.5 man-years are allocated to the task of market surveillance within these three areas [26].

In Sweden, the market surveillance activities are conducted by the Swedish Energy Agency along with the policy development in the area [27]. In contrast to Denmark and Norway, the Swedish Energy Agency has its own testing facilities, making it possible to conduct some of the product testing in-house [27]. A total of 20-25 people is working on the entire policy area of the Energy labelling and the Ecodesign Directive, divided on market surveillance (3-5 people), laboratories (10 people), policy development (3-4 people) and a few people working on communication, management, and associated areas [27].

4.1. The market surveillance process in Denmark, Sweden, and Norway

In all three countries the market surveillance consists of three main activities, namely document control, control of web shops and control measurements, where the products are being tested [26], [27], [28]. Especially in Denmark and Norway, the main part of the market surveillance is document controls, which for instance implies a review of the technical documentation to check for non-compliance [26], [28]. All information requirements are for instance checked through control of web shops and document control, where it is investigated whether the required information is available [11]. In Denmark and Norway, all testing is outsourced to accredited laboratories [11], [26]. As there are no accredited laboratories in Norway, the Norwegian Market Surveillance Authorities uses laboratories in other countries, e.g., in Denmark [26]. In contrast, the Swedish Market Surveillance Authorities have the possibility to do in-house testing for a range of product categories, such as lighting, electronics, e.g., computers and TVs, and some white goods, whereas other product categories are tested at external accredited laboratories [27]. Due to the small size of the lab, the in-house testing is mainly done with a strategic focus [27]. For instance, if there is an incentive to follow certain product groups in a long-term perspective to get an in-depth understanding of the product, or if new methods are developed or an area where the expertise could be especially relevant to make a difference [27]. For the product groups where the in-house testing lab is not suitable, external laboratories can be used. In contrast to the Norwegian and Danish rules, these laboratories do not have to be accredited, which means the Swedish Market

Surveillance Authorities are less challenged finding suitable laboratories to do the testing [27].

In all three countries, plans for which product groups to focus upon in the market surveillance are developed and the number of products tested varies from year to year [11], [26], [27]. In Denmark, typically 150 document inspections are conducted and around 60 products are tested [11]. In Sweden, 5-10 product groups are selected each year, some of the product groups will only undergo document inspection, whereas others also are tested in the laboratories [27]. In Norway, typically two products groups are in focus each year, and within each product group 5-10 products are tested [26]. In addition to this comes the products tests and document controls that are part of the collaborations in Nordsyn and EEPLIANT [26].

The determination of which product groups to test is in Norway based on a risk assessment considering for instance European reports on how big the energy saving potential is and on experiences from previous market surveillance results [26]. Furthermore, the selection of products for testing can also be based on a somewhat reactive market surveillance, where the Market Surveillance Authorities receive notifications from actors in the market about products suspected to be non-compliant [26]. In Denmark, the product groups chosen for tests are typically selected based on the results of the document controls [11]. In Sweden, the product groups selected for tests are based on several criteria for instance: potential energy or resource savings, if there is high interest in the product from consumers or if there is Swedish industry interest [27].

As of December 2020, the Danish Market Surveillance Authorities had no experiences with testing product compliance on material efficiency requirements, and hence material efficiency

requirement had only thus far been checked through document controls [11]. Both the Swedish and Norwegian Market Surveillance Authorities have experiences with testing durability and lifetime of lamps [26], [27]. In the case of Sweden, it was tested in-house [27]. Furthermore, the Swedish Market Surveillance Authorities have in-house experiences with testing water consumption of washing machines and the functionality requirements to washing, rinsing, and spin-drying efficiency [27].

All three countries collaborate with other market surveillance authorities through different projects. The European lead projects are organized through the Administrative Cooperation Group (AdCos), who among other things facilitates the EEPLIANT projects mentioned above [11], [17, pp. 1–7], [26], [27].

Furthermore, the three Nordic countries collaborate in Nordsyn projects. Nordsyn is a collaboration between all the Nordic countries on market surveillance specifically regarding the Ecodesign Directive and Energy Labelling [29]. The collaboration started in 2011 and has through the years completed several projects focusing on among others testing household refrigerators, lamps, heat pumps, and televisions [29].

4.2. Verifiability of current material efficiency requirements

A study from 2021, reviewed the material efficiency requirements in the 28 adopted implementing measures and existing horizon standards covering a range of different material efficiency aspects with the aim to determine the verifiability of the existing material efficiency requirements [30]. The resulting overview of the verifiability of the material efficiency requirements is shown in Table 2.

Table 2: Overview of how the existing material efficiency requirements in the implementing measures can be verified. Based on [30 p. 42].

Material efficiency requirements	Implementing measure concerned	Possible verification
Water consumption	Household washing machines	Performance test Harmonised standard: EN 60456:2021
Durability (reliability)	Electrical lamps and luminaries	Use tests or accelerated use tests Transitional measures: CIE 97 and EN 60064, 3,5: Annex A,
	Vacuum cleaners	Harmonised standard: EN 60335-2-69: 2012
Disassembly for reuse and repair	Electrical lamps and luminaries, household dishwashers, household refrigerating appliances, household washing machines, electronic displays and televisions, welding equipment, refrigerating appliances with a direct	Destructive or non-destructive disassembly test

	sales function, and computers and computer servers.	
Spare parts availability	Household dishwashers, household refrigerating appliances, household washing machines, electronic displays and televisions, welding equipment, and refrigerating appliances with a direct sales function.	Ordering spare parts using a concealed identity
Firmware and security controls	Electronic displays and televisions, and computers and computer servers.	Checking availability (websites or requesting the firmware using a concealed identity)
Repair and maintenance information	Household refrigerating appliances, household washing machines, electronic displays and televisions, and welding equipment.	Checking availability (websites or requesting the information using a concealed identity)
Data deletion	Computer and computer servers	Inspection of the product and user manuals
Disassembly for recycling	Household refrigerating appliances, and electronic displays and televisions.	Destructive or non-destructive disassembly test
Marking plastic	Electronic displays and televisions	Destructive or non-destructive disassembly test
Restriction of chemicals in certain parts	Electronic displays and televisions	Not possible to identify how this can be verified because there is no experience with testing these requirements.
Declaration of mercury content	Electronic displays and televisions	Document control

As visible from Table 2, some of the current material efficiency requirements are possible to verify through document control and by checking the availability of e.g., spare parts. For other requirements, standards exist, although not all standards are harmonised yet. For the majority of the existing material efficiency requirements, however, no standards are yet developed to support the verification of the requirements. With the likely to be adopted proposal for Ecodesign for Sustainable Products Regulation, the variety of material efficiency requirements for a long range of different product groups will increase, as will the need for supporting standards to verify the requirements. As mentioned above, the standardisation work under M/543 has resulted in a range of horizontal standards, but the product specific standards are still to be developed and harmonised.

4.3. Challenges in the current system for market surveillance of material efficiency requirements

Several challenges in the current market surveillance of material efficiency requirements have been identified in the interviews. One challenge is the price of the laboratory tests, which can be expensive [11], [27]. In 2015, the cost per appliance tested in a laboratory was approximately EUR 5,440 [31]. Combined with a fixed budget for the market surveillance, there is a risk of expensive tests not being prioritised [11]. If the proposal for Ecodesign for

Sustainable Products Regulation is adopted, it is a concern that the larger number of product groups and the larger variety of material efficiency requirements will increase this dilemma. It is a general concern in the EU if enough resources are allocated to the market surveillance [8, pp. 1819–1830]. On the other hand, the Danish Market Surveillance Authorities do not expect any challenges in the surveillance of further information requirements on material efficiency aspects, as these can be verified through inspection of the technical documentation and web shops [11].

Another challenge is the availability of accredited laboratories in the EU [11], [26], [27]. Especially for certain types of tests, such as water consumption, there are very few laboratories that can perform these tests, which is also one of the reasons for the Swedish Market Surveillance Authority to have their in-house test facilities [27].

An important aspect highlighted by all three Market Surveillance Authorities is the importance of product specific standards on how to verify the material efficiency requirements [11], [26], [27]. These are imperative for an effective and uniform market surveillance across the EU.

There are also challenges identified in relation to the information requirements and the use of the databases ICSMS and EPREL. As for the information requirements, it is imperative that it is very clear what information must be provided, and a simple requirement such as the production date on each

product is important to establish which requirements are in effect for the given product [26]. As for the use of databases, a better coordination between the Member States is important to ensure that products identified as non-compliant and thereby banned from that country's market will also be banned of the rest of the EU market [11].

For some material efficiency requirements, the long timespan from when the requirement enters into force to the market surveillance activities can take place is a challenge [27]. For instance, in the case of spare part availability, the requirement could be verified through 'mystery shopping', where the market surveillance authorities act as consumers and request a certain spare part. The challenge is that the requirement can be in effect long after the products are no longer on the market, potentially causing the enforcement to have little effect.

4.4. Recommendations for future market surveillance

The three Market Surveillance Authorities also highlight positive experiences that strengthens the market surveillance. The perhaps most important experience is the Swedish experiences with the in-house testing facilities. The fact that certain product groups can be tested in-house gives the authorities a technical knowledge and expertise about both the products and the testing methods that could not be achieved otherwise. The expertise of the Swedish Market Surveillance Authorities and the fact that the market surveillance and the policy development is gathered in the same department provides unique opportunities for the authorities to let the knowledge from the product tests become input to the policy making process. In the past, they have been able to both qualify and challenge for instance industry claims, and in some cases, the knowledge from the tests conducted in the in-house testing facilities have been the breaking point in getting requirements in place [27]. Furthermore, this thorough understanding of the products and the testing methods can be applied not only to the specific products being tested, but also provides a general knowledge of the testing process that can be helpful in situation where products are tested at external laboratories, and it is useful in the process of developing the testing methods [27].

Another experience that is recommended to continue is the possibility to charge the manufacturers, importers, or authorised representatives for the cost of acquiring and testing the products in case of non-compliance [11], [27]. Of course, this must happen in retrospect, so there is an initial cost for the authorities, and in case of compliance the cost cannot be transferred to manufacturers, importers, or authorised representatives [27]. It does, however, mean that in

case of many products being non-compliant, more products can be tested within the same budget.

Essential for an effective market surveillance, especially when testing products, is that the appropriate standards are available when the requirements are in effect [27]. In the case of the material efficiency requirements, it is positive that the horizontal standards are adopted, but it is imperative that the product specific standards specifying the tests methods are developed and harmonized as soon as possible. For the new requirements that may arrive with the adoption of the Ecodesign for Sustainable Products Regulation, it is essential that work on the appropriate standards is started so that they can be adopted and harmonised before the new requirements take effect.

Finally, especially the Danish and Norwegian Market Surveillance Authorities highlight the collaboration in both Nordsyn, AdCos and the EEPLIANT projects as positive and having a significant impact on the coordination of actions, priorities, and on the possibility to test products [11], [26]. A study from 2015 supports the recommendation to extend the collaboration between market surveillance authorities and estimates that through collaborative market surveillance in the Nordic countries, approximately EUR 28 million could be saved, with an investment of approximately EUR 2.1 million [31]. This equals a return of investment (ROI) of 13 [31].

5. CONCLUSION

In this article, we set out to investigate the following research question: *How are the material efficiency requirements of the ecodesign regulations verified through market surveillance and what are the challenges and potentials of the current approach?*

Our research shows that the experiences with market surveillance of the material efficiency requirements are still limited, even in the three countries; Denmark, Norway, and Sweden, which are some of the countries in the EEA that allocate most funding to market surveillance activities. With the limited experiences comes a potential risk for undiscovered challenges in the market surveillance of material efficiency requirements, which will only be overcome by gaining more experience with the market surveillance of material efficiency requirements. This challenge will only increase with the adoption of the Ecodesign for Sustainable Products Regulation as this would entail an increase in the number of different product groups covered and a large variety of material efficiency requirements.

Two imperatives to aid the market surveillance are the development of harmonised product specific standards and collaborations in for instance the Nordic

collaboration Nordsyn and the EEPLIANT projects. To ensure an effective market surveillance, it is important that the harmonised standards are developed in time before the requirements step into effect. As regards the collaborations, these are important both for the coordination of which product groups are selected for market surveillance, so that the countries do not select the same products, and for sharing experiences and test results.

A challenge mentioned by several of the interviewed market surveillance authorities is the cost of the product tests, entailing a risk for not prioritising expensive tests, in case of a limited budget. A recommendation is therefore to increase collaboration between market surveillance authorities and coordinate activities and share test results, but also to assess the resources allocated to market surveillance and ensure they are sufficient. With the adoption of the Ecodesign for Sustainable Products Regulation this will become even more important given the larger scope of the Regulation.

A final highlight from our research is the experiences of the Swedish Market Surveillance Authorities with their in-house testing facilities. By having sufficient test capacity in-house, compared to outsourcing this capability, the authorities have a much better basis for providing qualified input already in the policy process of setting up the requirements and developing the test methods. The past experiences did show that the expertise gathered through conducting the in-house tests provided the decisive argument to challenge for instance the industry claims.

6. REFERENCES

[1] European Commission and D.G. for Communication, *Circular economy action plan: for a cleaner and more competitive Europe*. Publications Office, 2020.

[2] European Commission and D.G. for Energy, *Ecodesign impact accounting annual report 2020: overview and status report*, Publications Office, 2021.

[3] R. D. Huulgaard, R. Dalgaard, and S. Merciai, "Ecodesign requirements for televisions—is energy consumption in the use phase the only relevant requirement?," *The International Journal of Life Cycle Assessment*, vol. 18, no. 5, pp. 1098–1105, 2013,

[4] C. van Rossem and C. Dalhammar, *Building synergies between EU product policy instruments or simply passing the buck? Analysis of the EUP, RoHS and WEEE Directives*, European Environment Bureau (EEB), 2010.

[5] F. Mathieux, F. Ardente, and S. Bobba, "Ten years of scientific support for integrating circular economy requirements in the EU ecodesign directive: Overview and lessons learnt," *Procedia CIRP*, vol. 90, pp. 137–142, 2020.

[6] European Commission, *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC*. 2022.

[7] European Court of Auditors, "EU action on ecodesign and energy labelling: important contribution to greater energy efficiency reduced by significant delays and non-compliance. Special report No 01, 2020," Publications Office of the European Union, 2020.

[8] K. Petersson and P. Nielsen, "Market Surveillance-the Prerequisite for Realising the Large Expected Savings from the Ecodesign Directive," presented at the ECEEE SUMMER STUDY, 2013, pp. 1819–1830.

[9] M. Baton, M. Scholand, S. Ardit, J. Hunter, J. Wilkes, C. Spiliotopoulos, A. Michelle, H. Rochat and E. Bush, "Closing the 'reality gap' -ensuring a fair energy label for consumers identifying weaknesses and recommending solutions to improve critical aspects of test standards for televisions, refrigerators and dishwashers," CLASP, ECOS, EEB and Topten, 2017.

[10] J. Krivošik and S. Attali, *Overview of challenges and opportunities Market surveillance of Energy Labelling and Ecodesign product requirements - Overview of challenges and opportunities*, 2014.

[11] Danish Safety Technology Authority, "Transcription of interview with Technical Advisor from Danish Safety Technology Authority." 01-Dec-2020.

[12] European Commission, *Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products*. 2009.

[13] S. A. Bøgh, *A World Built on Standards: A Textbook for Higher Education*. Nordhavn: Danish Standards Foundation, 2015.

- [14] E. Maitre-Ekern, C. Dalhammar, and H. C. Bugge, *Preventing Environmental Damage from Products: An Analysis of the Policy and Regulatory Framework in Europe*. Cambridge: Cambridge University Press, 2018.
- [15] E. Toulouse, *Developing measurement methods for EU Ecodesign and Energy Labelling measures. A discussion paper*. CLASP, 2014.
- [16] European Commission, *REGULATION (EU) 2019/1020 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 June 2019 on market surveillance and compliance of products and amending Directive 2004/42/EC and Regulations (EC) No 765/2008 and (EU) No 305/2011*. 2019.
- [17] European Commission, “REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Review of Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication of labelling and standard product information of the consumption of energy and other resources by energy-related products {SWD(2015) 143 final},” European Commission, Jul. 2015.
- [18] PROSAFE, “What is EEPLIANT2014?,” 2018. [Online]. Available: <https://eepliant.eu/index.php/new-about-eepliant/about-eepliant-1>. [Accessed: 01-Feb-2023]
- [19] PROSAFE, “What is EEPLIANT2?,” 2018. [Online]. Available: <https://eepliant.eu/index.php/new-about-eepliant/about-eepliant-2>. [Accessed: 01-Feb-2023]
- [20] PROSAFE, “What is the EEPLIANT3 Concerted Action?,” 2018. [Online]. Available: <https://eepliant.eu/index.php/new-about-eepliant/about-eepliant3>. [Accessed: 01-Feb-2023]
- [21] European Commission and D.G. for Communication, “Product database,” No date. [Online]. Available: https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database_en. [Accessed: 01-Feb-2023]
- [22] European Commission and D.G. for Internal Market, Industry, Entrepreneurship and SMEs, “Information and Communication System on Market Surveillance,” No date. [Online]. Available: https://single-market-economy.ec.europa.eu/single-market/goods/building-blocks/information-and-communication-system-market-surveillance_en. [Accessed: 01-Feb-2023]
- [23] European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Closing the Loop - An EU Action Plan for the Circular Economy*, European Commission, Brussels, 2015.
- [24] A. M. Bundgaard and R. D. Huulgaard, “The role of standards in support of material efficiency requirements under the Ecodesign Directive,” *Journal of Cleaner Production*, vol. 385, 2023.
- [25] Danish Safety Technology Authority, “Om os,” No date. [Online]. Available: <https://www.sik.dk/om-os>. [Accessed: 01-Feb-2023]
- [26] The Norwegian Water Resources and Energy Directorate, “Transcription of interview with four representatives from The Norwegian Water Resources and Energy Directorate .” 17-Dec-2020.
- [27] The Swedish Energy Agency, “Transcription of interview with representative from the Swedish Energy Agency.” 19-Jan-2021.
- [28] Danish Safety Technology Authority, “Sådan foregår kontrol med ecodesign,” No date., [Online]. Available: <https://www.sik.dk/erhverv/produkter/ecodesign-og-energimaerkning/saadan-foregaar-kontrol-ecodesign>. [Accessed: 03-Feb-2022]
- [29] The Nordic Council and The Nordic Council of Ministers, “Om Nordsyn,” No date. [Online]. Available: <https://www.norden.org/en/node/37097>. [Accessed: 07-Feb-2023]
- [30] A. M. Bundgaard, R. D. Huulgaard, A. Remmen, and M. C. Rincon Gil, “Requirements on material efficiency within the ecodesign directive,” 2021.
- [31] T. F. Larsen, *The Nordic Ecodesign Effect Project. Estimating benefits of Nordic market surveillance of ecodesign and energy labelling*, Norden, Copenhagen, 2015.