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A REVIEW OF SYSTEMS APPROACHES IN ECODESIGN AND ENERGY LABELLING

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Disclaimer

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INTRODUCTION

It is widely recognised that there are substantial energy savings to be made from considering an energy system – how products are combined and operated – in addition to those from each product.

Recent ecodesign and energy label regulations and the ecodesign and energy label working plan which is currently in development[1] are not adopting these approaches. The European Copper Institute wishes to understand why this is and if there is evidence to support challenging this omission. They commissioned this research to look into the experience with developing system related ecodesign and energy labelling regulations to date.

OVERVIEW OF STUDIES RELATING TO SYSTEMS

Systems have increasingly been studied explicitly, rather than as an 'added benefit' to a basically product based approach. This is in recognition of the additional energy savings which are accessible via a system approach.

This project has reviewed studies on eight product groups, most of them ecodesign and energy labelling preparatory or review studies, as shown in the table below. More details on each review are in separate appendices which follow this summary.

Coverage	Type of study	Completion date	Appendix
Walk-in cold rooms[2] (WICRs)	Prep study	2011	1
WICRs	Review study	Ongoing	1
Case study method for heating systems	Separate study by JRC	2016	2
Lighting systems	Prep study	2017	3
"points system" approach	Methodology development and case studies	2017	4
Pumps	Review study	2018	5
Heater and water heater package energy label[3]	Review study	2019	6
Heater and water heater package energy label	Technical assistance study	Ongoing	6
Solar Photovoltaics (PV) (system energy label)	Prep study	2018	7
Solar PV (system energy label)	Technical assistance study	ongoing	7
Building Automation and Control Systems (BACS)	Prep study	Due January2021	8
Power cables	Prep study	2015	Cu0273[4]

[1] The fourth working plan, for 2020 to 2024

[2] as part of professional refrigeration

[3] As part of boilers, space and water heaters

[4] ECI Publication N° Cu0273, March 2021. Retrieved from: https://help.leonardo-energy.org/hc/en-us/articles/360020746299

In addition a further Ecodesign preparatory study, Lot 8 - Power Cables, completed in 2015 has been reviewed separately by Bruno de Wachter for the European Copper Institute[5]. Relevant findings from this work are included in this review.

It can be seen from this table that there is quite a long history of interest in systems, although publication of most of the studies date from 2016 onwards. In two cases the systems aspect has been for a limited part of the regulation coverage – the heater and water heater package energy label for boilers, combination heaters and water heaters and the energy label for residential systems for solar PV. In most cases however the systems approach is a substantial part ("points system", pumps, and WICRs) or the whole of the study (BACS, lighting systems, power cables).

OPERATIONAL SYSTEMS REGULATIONS

Some regulations have been adopted which have somewhat extended the boundary of the requirements from the 'simple' product – for example consideration of Variable Speed Drives in the motors regulation. However, to date there is only one adopted regulation which addresses a complete system – the heater and water heater package energy label. This label has been reviewed in a number of studies (described in Appendix 6). Some of the findings are particular to the label but many are in common with those found in across the other product groups and appear to be widespread, as listed below.

STRONG POINTS IN THE FAVOUR OF SYSTEMS APPROACH

GREATER ENERGY SAVINGS POTENTIAL FROM SYSTEMS

All the studies asserted that the potential energy savings from a systems approach were much higher than from a component approach, although relatively few studies quantified these differences, for a range of reasons. The two exceptions were:

- The BACS study which estimated energy savings in 2040 from the systems approach of 184-272 TWh/year (depending on the level of ambition) compared with 68-112 TWh from a component only approach.
- The solar PV study which estimated energy gains in 2050 of 15.8 TWh from the system approach vs 10.4TWh from the component approach.

In the case of power cables there is no equivalent 'component approach' but the preparatory study estimates of energy savings for policies were substantial. Assuming that regulations was adopted in 2017 and first took effect in 2020 energy savings in 2025 of between 2-14 TWh/year in 2025 and 23-50 TWh/year in 2050, depending on the scenario.

INDUSTRY SUPPORT FOR SYSTEMS APPROACH

The heater and water heater energy package label was introduced in response to a request from parts of industry (solar thermal). In several other cases where a systems approach has been proposed, such as for lighting, pumps, and BACS, there is strong and sustained support for adopting a systems approach. This is a strong point in favour of the systems approach–regulations with strong industry support are more likely to be effective and deliver the expected energy savings.

[5] ECI Publication N° Cu0273, March 2021. Retrieved from: https://help.leonardo-energy.org/hc/en-us/articles/360020746299

POTENTIAL FOR JOB GROWTH

The power cable preparatory study found that legislation or regulations resulting in economic cable sizing in non-residential buildings would be expected to create jobs for electrical installers, cable manufacturers and distributors. The most significant job creation was expected in manual labour by electrical contractors.

A SYSTEM LABEL ENABLING MEMBER STATE SUPPORT SCHEMES OR GRANTS

One of the reviews of the package energy label stated that the heater and water heater package energy label had enabled a national support scheme for solar thermal systems; making it more straightforward to require a given system efficiency. Also the solar PV study (appendix 7) mentions that the performance ratio, similar to the Energy Efficiency Index (which it proposed for the energy label for residential systems) is used by some countries in their subsidy regimes[6]. This suggests that a system label could be helpful in this case too.

ECODESIGN AND ENERGY LABELLING APPLY IN THE SAME WAY IN ALL MEMBER STATES

Some studies (lighting, case study for heating systems, power cables) have suggested applying a systems approach using requirements in legislation other than ecodesign and energy labelling. These are under nationally adopted regulations adopted to meet the requirements of the Energy Performance of Buildings Directive (EPBD) or the Energy Efficiency Directive (EED). The advantage of these approaches is that they can add the obligation to check the performance of specified installations (lighting systems, BACS, pumps) on inspectors or auditors who are used to checking installations and are already performing inspections for other purposes. The main disadvantage expressed by the consultants undertaking the ecodesign studies is that the regulations are Member State (MS) specific. This means that they can take account of local circumstance but also that MSs may vary in the stringency of the requirements they set for the performance of energy systems. Whereas ecodesign and energy labelling apply in the same way in all MSs.

Solutions to explore: commission a study to identify existing articles in the EPBD and in EED which could be applied to placing obligations on energy systems and to review how a selection of MSs apply these in national legislation. If this finds that changes are necessary to address energy systems satisfactorily the Commission could be requested to include consideration of these specific requirements in the upcoming review of the EPBD and EED.

COMMON ISSUES FROM THE REVIEWS AND SUGGESTED SOLUTIONS TO EXPLORE

THE NEED FOR A SYSTEM MEASUREMENT STANDARD OR TRANSITION METHODOLOGY

In order to regulate for the energy performance for systems there need to be robust measurement standards and metrics in place, so that there is an agreed methodology to set requirements for energy performance. (For example EN 12464 for lighting indoor non-residential applications defines a metric for lighting levels, Lighting Energy Numeric Indicator, and provides a set of maximum lighting levels for different applications using this metric.) Ideally these should be international standards. In the short term a transitional method may be used while the formal standards are being developed. Examples are for are WICRs and pumps; the European Commission (EC) issued mandates for new systems standards for these which are now in place.

[6] Page 409 of the solar PV study report

NB this requirement for test standards and metrics also applies to component regulations. (For example professional clothes washers, and dryers and professional dishwashers lacked standards. Development of regulation was halted while the standards were developed in response to EC mandates. The draft working plan for 2020-2024 has included them in scope.) However, it is more common for a system to lack a measurement standard, perhaps because there has not been an industry or regulatory requirement for them.

Solutions to explore: identify early on in any consideration of a system regulation if a suitable measurement standard is available. If not then request the EC issue a mandate to develop one and/or develop a transitional method as part of the preparatory study or technical assistance study.

THE NEED FOR A CONSISTENT METHODOLOGY/TOOL TO CALCULATE SYSTEM EFFICIENCY

In addition to a formal methodology for system efficiency several studies (including the case study method for heating systems, BACS, power cables, solar PV energy label and heater and water heater energy label) have identified the need for a calculating tool, a spreadsheet or model. This would use parameters for components and the nature of the installation (eg for solar PV, panel orientation) to calculate a system efficiency value in a transparent and repeatable manner. Ideally this would be relatively easy to use and available free of charge.

Solutions to explore: identify early on a preparatory study if a methodology or tool to calculate system efficiency is not already available and if so develop one as part of the preparatory study or technical assistance study.

THE NEED FOR EASY ACCESS BY INSTALLERS TO COMPONENT DATA

In many cases of system requirements in energy label or ecodesign regulation it is (or proposed to be) the responsibility of the installer to demonstrate compliance. In order to this the installer needs easy access to data on the performance of the components making up the system (possibly to enter into a tool to calculate the system efficiency listed above). In principle this is easy, especially since some if not all of the components will have requirements to provide information under ecodesign and/or energy label regulations placed on them. In practice, for example for the heater and water heater package energy label, this has been found to be a barrier.

Solutions to explore: for components that have energy labelling regulations the full operational of EPREL[7] may address this issue. Alternatives could be to develop voluntary industry or MS databases of products.

THE CHANGE IN PLACING RESPONSIBILITY FOR COMPLIANCE FROM THE MANUFACTURER/SUPPLIER TO THE INSTALLER

For most energy label or ecodesign regulations the responsibility for compliance is on the manufacturer or supplier. This is the case for other EU regulations relating to products, such as RoHS or REACH. Manufacturers (or suppliers acting as their agents) are accustomed to this responsibility and have systems in place to ensure they meet them.

In many cases in energy label or ecodesign system regulations it is (proposed to be) the responsibility of the installer to demonstrate compliance. Installers are accustomed to taking responsibility for the quality of their installation but not for the compliance of the system as a whole. This was identified as a concern by some Member States and Market Surveillance Authorities (MSAs) as an issue by the pumps review.

[7] European Product Database for Energy Labelling

Solutions to explore: discuss installer compliance responsibility with stakeholders from the beginning of preparatory studies and develop robust arrangements to support them in their new responsibilities. These could include developing a specialist insurance product to provide installers with low cost cover for if a label is found to be incorrect or if a system does not perform to the required standard if the error was in good faith. An alternative may be to develop other business models, perhaps combining installations with an energy service, or heat as a service model.

MARKET SURVEILLANCE ISSUES

An effective route to checking compliance is an essential part of any effective regulation. Consideration of market surveillance is therefore a key part of developing regulatory proposals[8]. It is particularly important then that challenges related to market surveillance are addressed. A number of these have been identified:

UNCERTAINTY ON LEGAL MANDATE TO CHECK INSTALLATIONS

Discussions with MSs and MSAs for the pump review study (Appendix 5) found that there was ambiguity in articles of the Ecodesign directive as to whether this provided a mandate for MSAs to check compliance of installations (rather than the documentation or the lab testing of a component).

In addition, the study found that some MSAs did not have the legal power to carry out inspection on premises (under MS law).

These two legal concerns may restrict or block compliance of ecodesign of installations, which is required for systems approaches.

Solutions to explore:

- Ask the EC for direct guidance on interpreting the two apparently contradictory clauses in the Ecodesign framework directive. If the EC indicate that the framework directive does not allow inspection of installations then request consideration of a revision to address this.
- Ask the MS to review their regulations on market inspection, to clarify the situation on in-premises inspection. If this is not permitted then ask MSs to revise their regulations.

NUMBERS OF INSPECTIONS REQUIRED (UNIQUE INSTALLED SYSTEMS VS STANDARD COMPONENTS)

The pumps study (Appendix 5) identified an issue with the surveillance of systems: that each system installed is unique and is not fully representative of any other installation. In principle then every installation should be checked in order to get good compliance; if one installation is found to be non-compliant then that does not mean that another system installed by the same installer will be non-compliant[9]. This is different to the case of a component approach if each component is mass produced; if MSAs inspect the documentation and/or test the performance of a product and it does not meet requirements then the manufacturer can be ordered to rectify

[8] An article in the Ecodesign framework directive 2009/125/EC Article 15 point 7 states "The requirements shall be formulated so as to ensure that market surveillance authorities can verify the conformity of the product with the requirements of the implementing measure. The implementing measure shall specify whether verification can be achieved directly on the product or on the basis of the technical documentation".

[9] The BACS study suggested the compliance model for the Lifts Directive was a possible model for addressing compliance for installed systems such as BACS. However, a review of the experience with market surveillance of the Lifts Directive and consideration of the differences in consequences between failure to operate as required for lifts and BACS led the author to conclude that this model was not a valid solution. See Appendix 8 for details.

this for all the examples of this model. This means that the resources required to check the same level of compliance is much higher for systems than for most components.

NB there are some large products covered by existing regulations which are not mass produced, they are customised and made to specific requirements of clients, for example large boilers. The same issue with the testing or checking of one system not being transferable to another also applies to these customised products.

Solutions to explore: In the preparatory or technical assistance study consider the possibility of grouping systems into the most common sets of components so that some aspects of market surveillance of systems can be standardised.

MSAs BEING NOTIFIED WHEN SYSTEM IS 'PLACED ON THE MARKET'

For mass produced components it is straightforward, in principle, for MSAs to know which products are on the market, they can survey physical shops or online retail sites. The pumps study, (and the review of the Lifts directive as reported in the review of the BACS study, Appendix 8) identified the difficulty that MSAs have in knowing when a system is placed on the market – this is generally when a system is installed. (NB as noted above there are some large components covered by existing regulations which are not mass produced, they are customised and made to specific requirements of clients, for example large boilers. The same issue with not knowing when a product is placed on the market also applies to these customised products.)

Solutions to explore: in the preparatory study consider the practicality of developing a database where installers notify MSAs that a system covered by the regulation has been installed, where and by whom.

RETENTION OF ENERGY LABEL FOR MARKET SURVEILLANCE

One of the reviews of the heater and water package energy label[10] found one factor that made the requirements difficult to enforce is that the energy label may not be available to be checked: neither the home owner or the installer are obliged to retain it.

Solutions to explore: a database of installations, as described above could be a solution to this. Alternatively, the Commission is considering introducing a mandatory Digital Building Logbook. If this is adopted it is possible that this could include requiring the building owner to retain material used in quotes for installation, such as the heater package energy label.

COMMENTARY ON RESOURCES FOR MARKET SURVEILLANCE

Market surveillance is the responsibility of MSs. Data on what and how many market surveillance activities take place outside of EU funded concerted actions (such as EEPLIANT1, referenced in appendix 6) are not easily available. However it is recognised[11] that the level of activity is generally relatively low. This has also been the findings of the review studies that have considered market surveillance (Appendix 5 and Appendix 6). In a situation, as currently seems to exist, where MS resources for ecodesign and energy labelling market surveillance are limited, the added complexities and issues to check compliance of systems are unwelcome.

Solutions to explore: ask the EC to consider funding concerted actions by MSAs on market surveillance of newly adopted system regulations so that MSAs can develop experience with these without drawing on MS resources.

[10] In EEPLIANT1 – see appendix 6 for details

[11] For example in the European Court of Auditors special report on EU action on Ecodesign and Energy Labelling, January 2020

CONSIDERATION OF MARKET SURVEILLANCE IN ECODESIGN PREPARATORY STUDIES

The author's understanding is that the Methodology for Ecodesign of Energy-related Products (MEErP) 2011 does not include consideration of market surveillance.

Solutions to explore: A study reviewing the MEErP started in late 2020. This could review adding consideration of market surveillance to the methodology to ensure that this is taken into account from the start of developing draft regulations.

APPENDIX 1: REVIEW OF WALK-IN COLD ROOMS STUDY

DEFINITION

According to the definition provided in the International Dictionary of Refrigeration, a cold room is a room or cabinet maintained by a refrigerating system at a temperature lower than ambient temperature. Walk-in cold rooms are insulated rooms that provide refrigerated storage for a variety of items (mainly foodstuff, but also flowers, etc.). They may exist solely as refrigerators or freezers, or a refrigerator-freezer combination. (They are distinct from refrigerated containers, which may be stationary or may be used to transport goods, although the preparatory study on this[12] suggested that one policy option would be to include stationary refrigerated containers as a sub-category for WICRs as and when regulations were considered).

INTRODUCTION AND HISTORY

Walk-in cold rooms (WICRs) consist of the physical structure of the room, and the equipment providing and controlling the cooling, which may be local or remote. The energy efficiency of the system is affected by the insulation and air-tightness of the room, the efficiency of the cooling system components and how the different parts of the system are installed and operate. In other words they constitute an energy system, with the associated complexity and challenges in product policy regulation but greater potential for savings that these offer over regulating packaged products.

WICRs were in the scope of the Lot 1 preparatory study for DG ENTR (now DG GROW), Refrigerating and freezing equipment, which reported in May 2011. The report included policy proposals for WICRs. Regulations were developed, (with inter-service consultation in June 2013, and WTO notification in January 2014) and adopted for several of the product groups within this study:

- an ecodesign regulation, no 2015/1095, for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers (commonly known collectively as professional refrigeration) and
- an energy label regulation for professional refrigerated storage cabinets, no 2015/1094.

Both of these took effect in July 2016. No regulations were brought forward for WICRs.

A review study Ecodesign & EU energy label of Professional Refrigeration Products[13] started in January 2021. This is to review the existing regulations for the currently covered products but also to assess the appropriateness of introducing ecodesign requirements for WICRs and "the suitability of the test standards EN 16855-1:2017[14] and EN 16855-2:2018[15] to the extent of potential Ecodesign requirements for walk-in cold rooms". The project website states that a Consultation Forum meeting is planned for March/April 2022.

[12] Preparatory study on Refrigerated Containers, June 2020

[13] https://ecoprorefrigeration.eu

[14] Walk-in cold rooms - Definition, thermal insulation performance and test methods - Part 1: Prefabricated cold room kits

[15] Walk-in cold rooms - Definition, thermal insulation performance and test methods - Part 2: Customized cold rooms

FINDINGS OF PREPARATORY STUDY

The preparatory proposed a component-based approach, setting performance standards for each component of the WICRs[16], namely:

- Maximum U values for doors, walls, ceilings and floors
- Performance standards (expressed as Coefficient of Performance) for remote condensing units

The proposals did not include a system level performance requirement. However the study did suggest issuing a mandate to develop standards for WICRs(which was done, as described below).

WICR STANDARDS

The Lot 1 preparatory study found one test standard for WICRs, AHRI 1251 (SI) Performance Rating of Walk-in Coolers and Freezers (2009). There were also standards for components of WICRs such as the insulating enclosure and condensing systems.

An important metric within AHRI 1251 is the Annual Walk-in Energy Factor (AWEF). This is a ratio of the total heat, not including the heat generated by the operation of refrigeration systems, removed, in watt-hours, from a walk-in box during one year period of usage for refrigeration to the total energy input of refrigeration systems, in watt-hours, during the same period.

The European standards referenced above, EN 16855-1:2017 and EN 16855-2:2018 have been developed by CENELEC in response to the request by the European Commission under a mandate under the Ecodesign directive.

WICR REGULATIONS

The Lot 1 preparatory study reported one Minimum Energy Performance Standard (MEPS) for WICRs, from the US which took effect in 2009. This did not take a systems approach; it set minimum requirements for each component of a WICR (there was no commentary in the study report as to why this was the case). This was revised in 2017, the revisions taking effect in 2020. It is beyond the scope of this work to assess US regulations, however from commentary on the web[17] the new US regulations appear fall short of a full system approach – they seem to require components to be certified as being consistent with the required minimum AWEF (possibly in addition to meeting the performance requirement for that component), rather than requiring an installed system to meet a given AWEF. However, they do appear to place obligations for compliance on the designer and installer of systems to check that the components they use comply. This could be a step towards placing an obligation on the designer and installer for a system that they design or install to meet an energy performance requirement.

[16] Lot 1 Refrigerating and freezing equipment Task 7 report, section 7.2.3.4

[17] For example https://www.achrnews.com/articles/142281-get-ready-for-walk-in-cooler-and-freezer-regulations

COMMENTARY – DRAWING BROADER POINTS ABOUT A SYSTEMS APPROACH FROM THE EXPERIENCE WITH WICR TO DATE

The experience with WICRs illustrates the importance of test standards and metrics to the development of a system approach to ecodesign and energy labelling. In the US regulation appears to have been enabled to take a step closer to a system approach by the development of such a standard.

There are now adopted European system standards. This being the case it will be interesting to see whether the professional refrigeration review study finds that there is now a case for ecodesign regulations for WICRs and if so if they recommend a component or system approach.

APPENDIX 2: REVIEW OF JRC REPORT – 'FROM PRODUCTS TO SYSTEMS - A METHOD PROPOSAL FOR HEATING SYSTEMS AND APPLICATION TO A CASE STUDY METHOD FOR HEATING SYSTEMS'

INTRODUCTION

This report:
Environmental assessment to support ecodesign: from products to systems: A method proposal for heating systems and application to a case study. EUR 28250, Calero Pastor, M., Mathieux, F. and Brissaud, D[18]
was authored by two JRC staff and a French academic and published by the JRC in 2016.

To quote from the report, it was "developed within the JRC Institutional project "Better Regulation Assessments for the Circular Economy: Supply Chains of Raw Materials and products" (BRACE-RMP), in the context of the work package "Single Market: supporting better regulation and circular economy through Life Cycle Assessment" (SMART-LCA) under Deliverable 20164 on "Environmental assessment: from products to systems".

That is, it was developed quite separately from the preparatory, review and technical assistance studies directly related to developing ecodesign and energy label regulations. Important differences from these studies are:

- that the work does not seem to have included any stakeholder consultation.
- the aim of the work was not to directly support the development or revision of legislation.

The study developed a method to support the design of heating systems, applied this method to a case study and then discussed the method's added value and its limitations. The method is based on energy benchmarking of systems; a reference system with average performing components is the starting point, alternative designs are compared with this one. The method is not intended to be used as an ecodesign and energy labelling approach to a heating system. It is intended as a bridge between the 'top down' requirements of regulations stemming from the Energy Performance of Buildings Directive and the Energy Efficiency Directive and the 'bottom up', performance requirements on individual products set by ecodesign and the energy label. Nonetheless there are facets of this method which have parallels with ecodesign and energy labelling system studies which are discussed in the next section.

COMMENTARY ON THE PARALLELS BETWEEN JRC METHODOLOGY AND ECODESIGN SYSTEM APPROACHES

There are a number of features in the JRC methodology which are also present in developing systems approaches for ecodesign and energy labelling regulations. The author considers these to include:

- The importance of the system designer. The designer is the user of the JRC method and one of the key actors, along with installers, in several of the ecodesign system proposals. This is one of the distinguishing features of the system approach, the involvement of third parties, (beyond manufacturer or suppliers and the customer who may be completely separate from the manufacturer or supplier.)
- The importance of setting and defining performance parameters. JRC selected four key parameters (listed in the annex below). This is broadly analogous to having a measurement standard, with metrics and test

[18] doi:10.2788/165319

methods for a system, which is an essential first step in setting ecodesign regulations (for individual products or systems)

- The JRC study included the development of a (spreadsheet) calculation tool, to quantify the effect of changes to a design. Several of the ecodesign proposals for systems suggest developing an open access tool, to simply the application of regulations.
- The JRC method pre-supposes access to a database of component products, providing data on their performance. Easy access to product data has also been a requirement (explicitly or implicitly) of the ecodesign system methods.

ANNEX JRC KEY PARAMETERS

1. Energy heating demand: the energy useful for delivering sanitary hot water or space heating. In order words, it is the output energy provided by the system;
2. Non-renewable energy consumption: the NRE consumed or lost by the different components of the system needed to provide the service. It is the input energy (only the non-renewable) entering the system;
3. Energy losses of the system: the sum of the energy losses of each component of the system;
4. Low-emission energy efficiency: is the ratio between the energy heating demand and the non-renewable energy consumption.

APPENDIX 3: REVIEW OF LIGHTING SYSTEMS STUDY

INTRODUCTION AND HISTORY

Lighting controls/systems were one of the conditional product groups identified in the Working Plan 2012-2014. Subsequently an ecodesign preparatory study was commissioned, which completed in February 2017.

The study scope was for residential and non-residential lighting to examine:

1. If the scope of the legislation on lighting products should be opened to lighting systems;
2. If there are any issues left uncovered; and
3. If there are loopholes in the existing legislation.

The first of these objectives is of interest to this project reviewing ecodesign regulation for systems.

The study defined a lighting system as "as a holistic system including: light source, control gear, luminaires, multiple luminaires in a system, with sensors, controls and installation schemes".

This study was preceded by a review study on light sources which ran from January 2014 to October 2015. A presentation on the study was made to the Consultation Forum in December 2015 with a final review in December 2018[19]. New ecodesign and energy labelling regulations for lighting were adopted in 2019 and will take effect starting in September 2021. The ecodesign regulations also cover separate control gear[20] and lamps and control gear when contained in a single product, but do not include any regulations of lighting controls or systems.

FINDINGS OF PREPARATORY STUDY

PROPOSED REGULATIONS

The lighting systems study[21] was different from most preparatory studies in that it considered a range of regulatory routes to regulate lighting system energy efficiency; in addition to ecodesign and energy labelling the consultants looked at amending other policies to achieve the required outcomes. This was largely through the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD), although other supporting policies such as Green Public Procurement, and financial incentives are also mentioned. The report recognised that, in principle lighting systems could be regulated under the EPBD but the requirements are enacted differently in each Member State (MS). Further the report argued that in most MSs lighting is not addressed separately from other energy uses and therefore is not adequately addressed.

The study focused on lighting systems used in commercial indoor applications (with some particular applications such as restaurants excluded) and street and road lighting.

The report proposed that the following requirements should be addressed (NB only the proposals where ecodesign and energy labelling regulations are at least one possible policy route included[22]):

[19] https://www.eceee.org/ecodesign/products/lighting-systems/

[20] Generally a transformer to adjust the voltage from mains to the lamp's operating voltage.

[21] Preparatory Lighting Systems study final report, 2017

[22] For example there were other proposals for changes to regulations under EPBD, these are not included here.

- Require Lighting Energy Numeric Indicator (LENI) calculations and limits for indoor lighting installations (section 7.3.1 in study report)
  Setting maximum indoor illumination (LENI) requirements by application, using EN 12464 for method and metrics.
- Require Annual Energy Consumption indicator (AECI) and Power Density Indicator (PDI) calculations and limits in road lighting (section 7.3.2 in study report)
  Setting maximum lighting levels by application, using EN 13201-5 method and metrics.
- Information and documentation requirements at the design stage including labelling and benchmarking (section 7.3.5 in study report)
  Requiring standardised detailed information from the tenderers for lighting installations
- Information and documentation requirements at commissioning of new installations (section 7.3.6 in study report)
  Providing documentation that shows that the installation was in line with the system design, the equipment installed is as specified and operates as intended.
- Minimum performance requirements for luminaires and controls used within lighting systems (section 7.3.7 in study report)
  Setting requirements such as luminaire efficacy, minimum lifetime, and lumen maintenance requirements.
- Lighting systems energy label (section 7.3.11 in study report)
  NB the report suggested that a separate preparatory study would be needed to develop this

Many of the proposals could be addressed via a number of policy routes; where there was a choice the report suggested using product policy rather than EPBD or EED because the last two are implemented by MSs discretion, which the consultants felt lead to undesirable inconsistencies. Also EPBD does not cover some building types (even though they are as suitable for lighting system regulation as those included) and does not address all instances where new or replacement lighting systems will be installed (because its provisions are only required for renovations above a minimum size or proportion of the building area).

Additional work and Issues to be addressed before regulations can be drafted

The report states that additional work need to be done and issues would need to be addressed for these proposals to be adopted.

One feature applies across a number of proposals – selecting which legislative route to take - is it more appropriate to use: product policy (ecodesign and energy labelling); EPBD or EED?

Other aspects are:

- Two proposals (7.3.1 and 7.3.2) recognise that there will be situations when there will be a legitimate need for greater lighting than in the defined limits in particular situations or applications. So there needs to be a system whereby lighting specifiers can seek approval to exceed the regulatory limits, providing the supporting evidence is available to justify it. The study suggests one way of managing this may be a declaration of honour from a recognised independent lighting and energy expert.
- A number of proposals recognise that the process for verifying performance and conducting market surveillance for such product systems differs from that for packaged product. The study suggests that "the experience of performance declaration, verification and market surveillance processes that was used for the energy labelling of domestic heating and hot water systems is likely to be adaptable to the needs of lighting systems."[23]

[23] Section 7.3.1 page 272

- Several proposals require the development of good benchmarks for a representative set of applications, which are regularly updated[24].
- Adequate access to performance information for luminaires for designers to include in systems specifications (without luminaire ecodesign requirements)[25]
- A separate preparatory study for a lighting systems energy label

ENERGY SAVINGS FROM PROPOSED LIGHTING SYSTEM AND LIGHTING PRODUCT REGULATIONS

A major rationale for extending the role of product policy from packaged products to systems is the high additional savings that the latter offers, over and above that from the former. The lighting system preparatory study and the impact assessment for the adopted ecodesign and energy labelling regulations[26] were published at a similar time, calculated using the same or similar data, using the same calculation model[27] and the same approximate dates of regulations taking effect[28]. So in principle it is interesting to compare the projected savings.

However, there are substantial differences between the calculations with the result that it isn't possible to compare them. The differences are:

- The systems study projects the effects of all the proposals together – it does not separate out the savings from ecodesign and energy labelling regulations from those enacted via changes to EPBD or EED (partly because the selection of policy was not definitely decided)
- The systems study only addressed commercial, industrial and road and street lighting. The ecodesign and energy labelling regulations addresses all lighting applications including residential– a much bigger scope.

The lighting systems study projected energy savings of between 12 and 23TWh[29] in 2030 (cumulative savings between 68 and 127 TWh) and 24 and 48 TWh in 2040 (cumulative savings 254 to 501 TWh).

INDUSTRY VIEWS ON SYSTEMS APPROACH

Lighting Europe, the main European lighting industry association, is strongly in support of a product policy approach for lighting systems. They issued a press release in support of this in July 2017 and a short (3 page) position paper in 2018. Their main reason for advocating this is to access the substantial additional savings which are available from a systems approach.

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[24] For example, section 7.3.5 "it is also recommended that a good sent of bench mark values are developed for a representative set of applications. Most likely such bench mark values should be regularly updated due to the continuous improvements in the lighting market and when new applications are entering the market."

[25] Section 7.3.7 "the specification of luminaire requirements could also ensure that appropriate information on luminaire performance is made available to lighting specifiers/designers and installers."

[26] COMMISSION STAFF WORKING DOCUMENT, IMPACT ASSESSMENT, Accompanying the document COMMISSION REGULATION (EU) .../... laying down ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012 and COMMISSION DELEGATED REGULATION (EU) .../... supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council, 2019 with regard to energy labelling of light sources and repealing Commission Delegated Regulation (EU) No 874/2012

[27] MELISA, Model for European Light Sources Analysis

[28] The lighting systems study assumes most of the proposals will take effect in 2020 (for example 7.3.1 page 273)

[29] For a range of stringency/completeness of policy adoption.

COMMENTARY – DRAWING BROADER POINTS ABOUT A SYSTEMS APPROACH FROM THE EXPERIENCE WITH LIGHTING SYSTEMS TO DATE

There are a number of features of lighting systems, as explored in the preparatory study, which are of broader interest to a consideration of the systems approach in ecodesign and energy labelling, namely:

- The study identified substantial savings from regulating systems which are in addition to those from packaged products (although the savings are not separated out for the different policy proposals so it not possible to say how much of these are from the product policy proposals)
- For a number of their proposals the consultants preferred legislative route was product policy (rather than EPBD or EED) as they thought this would have a broader scope and offer greater consistency between MSs.
- Adopted standards for metrics and maximum lighting levels for interior (non-residential) spaces EN 12464) and roads and streets (EN 13201-5) are prerequisites for regulation for regulations on these topics.
- Verifying performance and conducting market surveillance requires a different approach to that used for packaged products. The study suggested that the model used for the heater package label could be adapted for this.
- Some of the proposals pre-suppose easy access to data on component products in order to produce detailed system designs, checking system installation and commissioning and generating a system label.

More generally, it is possible that the fact that none of the lighting systems proposals have been adopted in regulation, (even though ecodesign and energy labelling regulations for lighting have been adopted, providing a possible opportunity to include at least some of the lighting systems proposals) is indicative of a fundamental difficulty; that is, because the barriers to taking a systems approach are considered too high.

On the other hand:

- The lighting product study was completed before the lighting systems study
- The lighting systems report recognised that additional work (listed above) would be needed in order for the proposals to be adopted.
- the route from a completed preparatory study can be long and involve several iterations; for example the report on the lighting (product) study was published in October 2015 and the revised regulations weren't adopted until October 2019, four years later[30]. The Commission's delays in bringing forward legislation was noted by the report[31] by the European Court of Auditors on ecodesign and energy labelling
- As reported by ECOS, progress on ecodesign and energy labelling was slow in 2020 with no new ecodesign measures adopted[32]

So the lack of visible activity on lighting systems may have no particular significance.

[30] However during that time there were meetings and consultations, whereas the author is not aware of these activities for lighting systems.

[31] EUROPEAN COURT OF AUDITORS, Special Report 01/2020: EU action on Ecodesign and Energy Labelling: important contribution to greater energy efficiency reduced by significant delays and non-compliance, 2020

[32] https://ecostandard.org/news_events/2021-resolution-the-eu-must-advance-ecodesign-upgrades-to-reach-its-climate-objectives/

APPENDIX 4: REVIEW OF "POINTS SYSTEM" STUDY

INTRODUCTION AND HISTORY

The European Commission instigated a technical assistance project to evaluate and derive a "points-system" methodology that could be applied to the development of Ecodesign regulations for complex products and/ or systems. It started in January 2016 and completed in July 2017. The study aimed to evaluate whether "it was feasible to devise an assessment methodology for product systems comprised of technology/design modules that considers the ensemble of modular technologies deployed."

The project was structured differently to the ecodesign preparatory or review studies, comprised of five tasks, with one report for each task:

1. Stakeholder consultation
2. Review of state-of-the-art methods
3. Developing a prospective method
4. Testing the method on case studies (machine tools and data storage were selected)
5. Further development of a case study (data storage was selected)

During the study the following[33] were proposed as situations where a point approach might be considered because:

a) there is a mix of quantifiable and more qualitative product ecodesign features; it is necessary to also ascribe some value to the qualitative features because these are expected to bring ecodesign benefits
b) although the presence of specific ecodesign features is known to bring ecodesign benefits, the relative importance of the benefit to a given ecodesign performance parameter is difficult to determine in a reliable manner at the level at which the scope of a prospective regulation would apply
c) it is too complex to apply a rigorous performance assessment method in practice but a points-based approach, which awards points depending on the ecodesign features used, could provide an acceptable compromise that allows requirements to be set that encourage progress in a positive direction without being overly constraining.

Of these situations the author thinks that b) and c) could apply to systems of energy related products.

DEVELOPMENTS SINCE THE COMPLETION OF THE STUDY

After the points study was completed there was an ecodesign consultation forum meeting on 'DG GROW Lot5 products', ie machine tools and welding equipment, in October 2017. This was followed by a public consultation on potential measures for regulating the environmental impact of machine tools and welding equipment in Q2 2018[34].

Regulations on welding equipment were adopted in 2019[35] and take effect from January 2021 (information requirements) and January 2023 (efficiency limits for the power supply and circular economy aspects).

[33] Direct quote from page 15 Task 3 report

[34] https://ec.europa.eu/info/consultations/public-consultation-potential-measures-regulating-environmental-impact-machine-tools-and-welding-equipment_en

[35] Regulation 2019/1784

Regulations[36] on Enterprise servers and data storage products (DG GROW Lot 9) were adopted in 2019 which take effect (different aspects) in March 2020, March 2021 and January 2023.

FINDINGS OF THE TECHNICAL ASSISTANCE STUDY

METHOD TO DEVELOP A POINTS BASED REGULATION[37]

Tasks 1 and 2 found that there were no existing methods which met stakeholders' requirements so a new method was developed in Task 3. This consisted of ten steps[38]:

1. Assessment of key lifecycle stages
2. Assessment of product scope boundaries and associated impacts at the wider (extended product or product-system) level
3. Selection of environmental impact criteria
4. Determination of the phases at which product design may influence lifecycle impacts
5. Assessment of whether a points system approach is potentially merited or not (against three, set criteria)
6. Assessment of the implications of product modularity
7. Assessment of the implications of product performance sensitivity to the final application
8. Determination of environmental impact budgets
9. Normalisation and awarding of points
10. Support to regulatory decision-making

These are somewhat analogous to the eight steps of the Methodology for the Ecodesign of Energy-related Products (MEErP) which is required to be used for ecodesign preparatory studies

The task 3 report[39] states that market surveillance (or conformity assessment) against a points system regulation will be more complex than for a product based regulation, as there will be a greater number of aspects to assess and a need to put them into a single accounting network (the points system). However it asserts that checking each individual element is no more difficult than for a single product and considers that it should be no more complex than assessing compliance of the only existing 'system' regulation - the heating package energy label.

MACHINE TOOLS CASE STUDY

This case study addressed one element of machine tool performance, energy performance in the use phase (previously identified in the 2012 Preparatory Study for this product group as the dominant environmental impact). The report stated "it is certainly conceivable that other environmental impacts could be treated using a similar methodology"[40].

The case study concluded[41] that the Task 3 methodology was fit for purpose for the application tested (that is to develop an ecodesign regulation for the energy use aspect of machine tools).

[36] Regulation 2019/424

[37] Analogous to the Methodology for the Ecodesign of Energy-related Products for 'simple' products

[38] Described in section 5 of the task 3 report, page 22 onwards

[39] Section 7, page 38, Task 3 Method Development

[40] Page 38 . Task 4 machine tools case study

[41] ibid

That being said "much of the methodological approach set out could also be used in a conventional Ecodesign regulatory approach where specific and generic requirements are specified"[42] although "as there is still a great deal of uncertainty surrounding many of the elements applicable to machine tools, a softer and more flexible approach [which is available in the points system but not in the conventional approach] to promoting good ecodesign practice"[43]

Also "many areas that will still require further development and confirmation before this method could be deemed to be suitable to be applied to machine tools for Ecodesign regulatory purposes". These included[44]:

- Expanding existing lists of design options and saving potentials (some are present in ISO 14955-1:2014[45] which was extensively referenced in the case study, but these are incomplete).
- Verifying which elements should be included in checklists used for the product development stage and the user guidance stage, building on ISO 14955-1:2014
- Checking that the points allocation reflects the calibre of the underlying evidence
- Considering the weightings to be applied to product development and user guidance stages.

The case study considered conformity assessment against the points system[46]: this would be solely an audit of documentation and calculations with no physical testing involved.

The study states that it would make demonstrating conformity more robust and less resource intensive for the machine tool designer "if software were developed to support the machine tool design process where the required informational inputs and algorithms [to meet the ecodesign regulations] were embedded in the program."[47]

DATA STORAGE CASE STUDY AND EXTENDED CASE STUDY

The case study identified possible features of data storage units that would be assessed in an ecodesign points system. To do this it used data from the DG GROW Lot 9 (servers and data storage products) preparatory study and impact assessment, and from the database of US ENERGY STAR rating of data centre storage performance. The latter has data for 99 products on active power tests and the idle ready capacity using an industry standard, Storage Networking Industry Association (SNIA) Emerald test[48]. The proposed performance metrics also references ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) thermal guidelines for data centres[49].

[42] In other words it would be possible to write 'conventional' regulations for machine tools.

[43] Pages 40-41 Task 4 machine tools case study

[44] Pages 38-39 Task 4 machine tools case study

[45] ISO 14955-1:2014, Machine tools — Environmental evaluation of machine tools — Part 1: Design methodology for energy-efficient machine tools. In November 2017 this was revised by ISO 14955-1:2017

[46] Page 40 Task 4 machine tools case study

[47] Page 40 Task 4 machine tools case study

[48] Page 16 Task 3 data storage case study

[49] Page 18 Task 3 data storage case study

The case study concludes that the Task 3 points system methodology can be adapted and applied to data centre storage products but a larger pool of data on performance is necessary to provide sufficient confidence to regulate[50]. Without this, expert judgement was required to develop a weighting of different factors.

Market surveillance was mentioned in the case study but was not discussed in detail.

The extended case study (task 5 report) considered in greater detail specific technical issues that were raised in the first case study but did not draw any further conclusions on the suitability or practicality of an ecodesign regulation for data storage centres using the points system.

COMMENTARY – DRAWING BROADER POINTS ABOUT A SYSTEMS APPROACH FROM THE "POINTS SYSTEM" STUDY

The "points system" study aimed to explore a possible route for regulations for some of the more complex energy uses, some of which would be qualified as systems.

The proposal has some components in common with other systems approaches considered in the review:

- Neither case studies would have been possible without existing measurement standards and metrics (ISO 14955-1:2014 for machine tools; US ENERGY STAR and SNIA Emerald test for data storage).
- The development of design software which could incorporate the requirements of an ecodesign regulation for machine tools was regarded as a desirable, in part to ease market surveillance (similar situation to solar PV, JRC heating systems study).
- The challenges arising from market surveillance of a system approach were touched on but have not been considered in detail.

Ecodesign regulations for the product groups of both case studies have been considered following the completion of the points study. In neither case was the "points system" adopted:

- Machine tools have not been regulated to date.
- Data storage was included in a 'conventional' regulation.

The author has no information on whether the European Commission is considering the "points system" for any product group, or if any form of regulation is being considered for machine tools. The "points system" study was completed three and a half years ago but given the long lead times for new approaches and for developing regulations for new product groups it is not possible to draw conclusions on the European Commission's view on the "points system" and what, if any, product group they may be considering adopting it for.

[50] Page 54 Task 3 data storage case study

APPENDIX 5: REVIEW OF THE PUMPS STUDY

INTRODUCTION AND HISTORY

A pumps ecodesign regulation, 547/2012, was adopted in 2012 and took effect in January 2013. A pumps review study started in December 2014 and completed in December 2018. In addition to reviewing the current regulation the study considered the extension of the scope of the regulation to include a broader range of products, "Lot 28 waste water pumps" and "Lot 29 Large pumps and pumps for pools, fountains, aquariums". Preparatory studies had been undertaken for both these product groups but no regulations had been adopted.

The proposed revision of the pumps regulation is relevant to systems because it considered a 'semi-systems' approach – the extended product approach (EPA), whereby a pump is integrated with a motor and a controller (generally a Variable Speed Drive (VSD)) and the efficiency of this 'pump unit' is regulated. (NB this is not considered a full system approach; a system in this context might be a 'water supply unit', consisting of: the pump unit, valves, pipes and controls)

European standards for the energy efficiency of a pump EPA was under development during the review study[51] and were published in May 2019:

- EN 17038-1 'Pumps - Methods of qualification and verification of the Energy Efficiency Index for rotodynamic pump units - Part 1: General requirements and procedures for testing and calculation of Energy Efficiency Index (EEI)'.
- EN 17038-2 'Pumps. Methods of qualification and verification of the Energy Efficiency Index for rotodynamic pump units. Testing and calculation of Energy Efficiency Index (EEI) of single pump units'

It is unclear whether the Commission are actively pursuing a revised regulation and if so, if the intention is to include the extended product approach.

FINDINGS OF THE PUMPS REVIEW STUDY

POTENTIAL SAVINGS AND PROPOSED REGULATIONS

The review study[52] found the potential for substantial additional savings from revising the pumps regulation. Some of these were due to extending the scope but the majority would come from setting minimum efficiency requirements for a pump unit (ie using an EPA approach). The consultants estimated that the savings for the current coverage would be in the range of 37 to 40TWh/year in 2030; with the increased coverage it would be in the range of 43-48TWh/year[53]. This approach was designated Policy Option 1 (PO1). There is no estimate of the savings from the alternative simple product approaches in the report (designated Policy Option 2 (PO2) and Policy Option 3 (PO3)); these are said to be "only a fraction"[54] of the savings from the EPA approach.

The consultants' strongly preferred option was PO1. This required verification of performance at the point when the products were put into service and placing the responsibility for ensuring compliance of the assembled pump

[51] In response to mandate 498 from the European Commission

[52] Ecodesign Pump Review Extended report (final version), Larisa Maya-Drysdale, Ulrik Vølcker Andersen, Baijia Huang, Annette Gydesen, Jan Viegand, Roy van den Boorn, Sanne Aarts, Leo Wierda and René Kemna, 2018

[53] Table 2, page 9 of report

[54] Page 9 of report

unit on the installer. In the course of discussions with Market Surveillance Authorities (MSAs) in the course of the project the MSAs said that this was not practicable. These issues are described more fully in the next section.

MARKET SURVEILLANCE ISSUES

Market surveillance was given an unusual degree of attention in this review study. MSAs were interviewed about their experience with the market surveillance for pumps and electric motors[55]. Separately there was a meeting[56] between the consultants, representatives from different Member States and MSAs and EuroPump to find discuss whether the verification approach for the preferred policy option (PO1, obligation on the installer and verification when products put into service) would be possible.

The report lists the issues as:

1. Installers are held accountable for compliance, which is not a common practice in Ecodesign. Stakeholders felt that placing the burden of compliance and documentation of conformity on installers would be problematic[57].
2. Some MSAs do not have the legal power to carry out the inspections on premises.
3. MSAs have no means to identify where and when pump units are installed
4. Requirements on installations entail surveillance of a myriad of individual installations, which reduce effectiveness and increase the costs (whereas a product may be representative of thousands of products sold)
5. Some MS representatives and MSAs considered that verification of installed products is outside the scope of the Ecodesign Directive.

To expand on the last point: there was a difference of opinion on the interpretation of two clauses of the Ecodesign directive. They are :

Ecodesign Directive 2009/125/EC Article 15 point 7:

"The requirements shall be formulated so as to ensure that market surveillance authorities can verify the conformity of the product with the requirements of the implementing measure. The implementing measure shall specify whether verification can be achieved directly on the product or on the basis of the technical documentation."

Some Member States representatives and MSAs indicated that Article 15 point 7 prevents establishment of requirements and market surveillance activities which take into account the system in which the product is installed.

And:

ANNEX VII

"The implementing measure must specify, in particular:

[55] Described in Annex 10 of the report

[56] Covered in section 13 Market surveillance, page 250-261, minutes in Annex 12

[57] Annex 10 page 425, also mentions the possible difficulty for installers in "information on individual products from different manufacturers"

4. the requirements on installation of the product where it has a direct relevance to the product's environmental performance considered;"

Some stakeholders felt that this meant that verification of the installation was acceptable. They recommended that should a revision of the Ecodesign Directive take place in the future inconsistencies between Article 15, point 7, and Annex VII be resolved, in order to make inspections of installed products possible. The consultants discussed these issues with the European Commission. They recommended that should a revision of the Ecodesign Directive take place in the future inconsistencies between Article 15, point 7, and Annex VII be resolved, in order to make inspections of installed products possible.

In terms of alternative means of accessing the energy savings from the EPA approach: "Member State representatives and MSAs suggested that other public mechanisms could also be used for verification of the compliance of pump units on-site. However, this possibility could not be included in an ecodesign regulation for pumps because it is dependent on other policy instruments. But Member States who want to carry out inspection of the compliance of the pump unit on-site could do that in combination with other surveillance activities for instance inspection of safety on workplaces, the energy performance certificate of buildings and energy management schemes. However, this will have to be worked out at national level."[58]

INDUSTRY VIEWS ON SYSTEMS APPROACH

EuroPump, the main European association of pump manufacturers, is strongly in support of taking the Extended Product Approach to product policy for pumps. They issued press releases[59] on this topic January, May and December 2020 and in January 2021. In these they claim that the savings from an EPA regulation would be much higher than a single product regulation –35 TWh/year as against 5 TWh/year for the EU. They also state that this approach has already been taken in the ecodesign regulation for circulator pumps[60] (NB the author disagrees; these are sold as complete units, not in component parts).

COMMENTARY – DRAWING BROADER POINTS ABOUT A SYSTEMS APPROACH FROM THE EXPERIENCE WITH PUMPS TO DATE

There are a number of features of pump units as Extended Products, as explored in the review study, which are of broader interest to a consideration of the systems approach in ecodesign and energy labelling, namely:

- The study identified substantial savings from regulating pump units which are in addition to those from pumps, although these weren't separately quantified
- There is an international standard for pump unit efficiency, published May 2019, which is a prerequisite for regulation
- Market surveillance of installations is required by the Extended Product Approach. MSs and MSA thought that this was not a realistic option at the current time. Some of the barriers to this are legal (not a permitted option under Article 16 point 7, in some MSs inspectors not having the legal right to enter premises) some are practical (MSA don't know when pump units are installed; each pump unit installation is unique and requires a separate verification action).

[58] Page 260 of the report.

[59] https://europump.net/news-events

[60] Used for central heating systems and other closed loop systems. Regulation 641/2009 amended by 622/2012.

- Some stakeholders suggested regulating pump unit efficiency (extended product approach) via other legislative routes, such as those offered via national regulation in line with EPBD.

APPENDIX 6: REVIEW OF HEATING AND WATER HEATING PACKAGE ENERGY LABEL STUDIES

INTRODUCTION

The heating/water heating package label is central to the discussion of a systems approach in Ecodesign and Energy Labelling as it the only operational example of a system approach enacted to date. Preparatory studies and reviews of other product groups where a system approach was being considered (e.g. lighting systems, points system) refer to this as a workable example of such an approach; the idea being that if it works in this case the concept should be transferable to other systems.

Key aspects of the heater package label system are:

- That the label is for a package[61] [62]composed of different products, which may come from different suppliers
- The installer, who combines these components together in a system is responsible for the energy label.

This note considers the evidence for the success of the package label to date and draws tentative conclusions from this for the issues and possible solutions for other system approaches.

HISTORY

INTRODUCTION OF REGULATIONS

The package label was introduced initially in energy label regulation 811/2013 for space and combination heaters, and 812/2013 for water heaters (with associated ecodesign regulations 813/2013 and 814/2013 respectively). They entered into force in September 2015, and the package energy label was also included in the later regulation,1187/2015, on solid fuel boilers.

The package label was developed so that suppliers of solar devices and temperature controls, often SMEs, could demonstrate the energy saving benefits of their products, which are only apparent when combined with other components in a package.

The implementation of a heating package involves a number of different actors: system designers, manufacturers, suppliers, dealer, installers and end users, none of whom can act in isolation from the others. The process was widely accepted as being challenging, particularly for the installer, who was responsible for producing the package label.

The approach was considered sufficiently novel to justify a €1.4 million multi-EU Member State (MS) project, "Label Pack A+"[63], funded under H2020, which ran from March 2015 (6 months before the regulations took effect) to July 2018. The project objectives are given in full in the Annex but broadly the project was designed to

[61] This terminology is different from that used in the BACS preparatory study reports which use the term "packaged products" to describe components of BACS, products which are sold and can be tested as units and "installed products" to described complete systems.

[62] In the regulations "packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device" and "packages of water heater and solar device" respectively

[63] Project details and deliverables at https://cordis.europa.eu/project/id/649905

raise awareness and offer training to all the actors in the supply chain and customers, and to develop an online tool to calculate the package label energy class. The project co-ordinator was Solar Heat Europe (ESTIF) and most of the country partners were solar thermal trade associations, reflecting the strong interest of solar thermal manufacturers and installers in the package label.

CROSS MS MARKET SURVEILLANCE CONCERTED ACTIONS: EEPLIANT1 AND EEPLIANT3

EEPLIANT2014, also known as EEPLIANT1[64] was a H2020 funded project which ran from 2015 - 2017. Its key objective was to help deliver the intended economic and environment benefits of the EU Energy Labelling and Ecodesign Directives by increasing the rates of compliance with the energy efficiency requirements. This was achieved through the joint monitoring, verification and enforcement activities of fifteen Market Surveillance Authorities (MSAs) and one national agency. The project undertook market surveillance on three product groups, one of which was space and combination heaters, against regulations 811/2013 and 813/2013. This included:

- Inspections of technical documentation for 48 heaters (10 electric boilers, 19 "small" gas boilers, and 19 heat pumps).
- Testing at an accredited laboratory of 10 "small" gas boilers and 7 heat pumps.
- Testing in-situ of two "big" gas boilers.

No document inspections or tests were performed on any package systems. However the authorities undertook a survey to examine the heat system installers' knowledge of the regulatory requirements for energy labelling of packages.

EEPLIANT3 is currently underway and includes water heaters as one of the six product groups subject to compliance testing – document and label inspections and laboratory testing. However solar water heaters and the package label are not listed among the products included in the projects scope on the web site[65].

REVIEWS AND TECHNICAL ASSISTANCE STUDIES

There were separate, parallel review studies[66] of the ecodesign & energy labelling regulations for space heaters & combination heaters and water heaters; both ran from 2017 to July 2019 and both included consideration of the package energy label.

These have been followed by a follow-up study[67] providing technical assistance to the European Commission, and providing inputs to Working Documents for the revised regulations and the associated impact assessments. This study started in October 2019 and is due to complete in November 2021. One of the four working groups is on calculations and includes a sub-task on 'Updated package label calculation'.

[64] https://eepliant.eu/index.php/new-about-eepliant/about-eepliant-1

[65] https://eepliant.eu/index.php/new-products/wp6-heaters?id=120

[66] A review study is commissioned to review whether or how ecodesign and energy labels are working and if there is scope to revise the regulation in order to realise additional cost effective energy savings. This is the first step in developing possible revised regulations.

[67] https://www.ecoboiler-review.eu/index.html

EVIDENCE ON EXPERIENCE OF THE PACKAGE LABEL TO DATE

Evidence on the experience of the package label to date has been gathered by the project listed above. The findings from all of these are below.

LABEL PACK A+

This project included assessments of the implementation in the six partner countries, and in ten other EU MSs. They were undertaken by the project team partners, none of whom were evaluation specialists and they were not theory based so they are limited in scope and robustness. However, they give an overview of the adoption of the label immediately after it came into effect.

The assessment of the partner countries[68] found several Issues with implementation of the package label. Those which are relevant to other system approaches in ecodesign and energy labelling are:

- The energy label was perceived by some professionals as a valuable tool to communicate with the end-consumer on the added value of solar thermal systems. But some experts saw the label as an administrative procedure which just created additional work, with little marketing value.
- Support schemes and grants from MSs which required the package energy label[69] provided a strong incentive for suppliers, installers and customer to engage with the label.
- The lack of harmonization between the energy label and the national Energy Performance in Buildings Systems calculation/consideration methodologies was a barrier to using the data in the product/package fiche, as well as to dissemination of the opportunities associated with the adoption of more efficient, higher rated class heating solutions [A paper[70] which analysed the package label also highlighted the need to improve the alignment of building-related product policies with the Energy Performance of Buildings Directive.]
- There was a lack of clear procedures for market surveillance of package labels and a lack of compliance checking, which meant there was less incentive for compliance.
- On the other hand, it was thought that enforcement of the label could lead to more installers choosing to install only standard packages with the label provided by the manufacturer, thus working against one intention of the label, to help SMEs market their products.
- Consumer awareness of the label was low and there was lack of consumer demand for the label.
- A high share of solar thermal systems is retrofitted to the existing heat generator (mainly gas boilers) in this situation no package label is required, as the energy label is only required on new packages.
- In many cases the use of solar thermal panels improves the real efficiency but does not improve the package efficiency class[71].

[68] Label Pack A+ - "Package Label implementation assessment report", Joana Fernandes, ADENE, Pedro Dias, ESTIF, October 2017. This report describes the Strength, Weaknesses, Opportunities and Threats of implementation, including the implementation of some of the project tasks, such as uptake of training and stakeholders response to the project online tool.

[69] There was a grant scheme in Portugal during the project which did this.

[70] Maria Calero-Pastor Fabrice Mathieux, Daniel Brissaud and Luca Castellazzi (2017) From Product to System Approaches in European Sustainable Product Policies: Analysis of the Package Concept of Heating Systems in Buildings, Energies 2017, 10(10), 1501

[71] This is an artefact of the current methodology for calculating the package energy class. This was identified as an issue in the review studies and is being addressed in the technical assistance study, as described below.

The study also found that the online tool could be improved by Integration of a database of with data from manufacturers.

The surveys of stakeholders in other EU (non-project partner) MSs[72] found that:

- Awareness of the package label was low
- Of those who were aware of it less than half (45%) considered the label a good idea and a lower proportion (40%) were "satisfied" or "more or less satisfied" with it.
- The level of compliance checking was a concern – only 20% of respondents thought that their national authority were performing any checks and most felt that more surveillance activity was needed to drive widespread take up.
- Stakeholders were also critical of the calculation method, the efficiency categories and the label design.

EEPLIANT1

The survey of heat system installers found that installers generally knew little about the energy label for "packages".

Overall the project's finding for the package label were that:

"These requirements are difficult to enforce in practice. The regulation requires that the installer shall supply the label to the consumer during the sales process, but the authorities are not always able to check it. The consumer is not obliged to keep material from the installer, and neither are installers required to do so for quotations.

The current definition of "package" in the regulation implies that almost all gas boilers and heat pumps become "packages", because they incorporate an integrated temperature control. This may confuse consumers, because what they see as one product is labelled both with a product and a separate package label. Therefore, extra information activities are needed to ensure that consumers are fully able to appreciate the additional contents of the package label. Finally, [] many manufacturers are also unaware of the differences between the requirements in the Ecodesign Directive and the Energy Labelling Directive. There would be value in raising the awareness among manufacturers about this requirement".

As stated above it does not appear that EEPLIANT3 will address the package label in the work package addressing water heaters.

REVIEW AND TECHNICAL ASSISTANCE STUDIES

Both the boiler and water heater review studies identified the package label as an issue which needed to be addressed in revisions of the regulations. The installer label including solar thermal devices was a particular concern. The finding of both studies agree but are summarised more completely in the Task 1 report of the water heater review study[73]. The issue that is relevant to the broader issue of package label (as against the specifics of solar water heaters) is :

Installers are having trouble with the installer package label, i.e. where the installer has to determine the energy label rating from a combination of components, e.g. a conventional water heater and a solar device from

[72] Label Pack A+ - "Analysis of the implementation of the "package label" in several European countries", Norman van der Meer & Christoph Urbschat, Eclareon, April 2018

[73] Water Heaters & Storage Tanks Ecodesign and Energy Labelling review study, Task 1 Scope – Policies & Standards, Final report, July 2019

different manufacturers. Reportedly the reason is that it is too complex and/or training is not an installer's priority (the nature of the complexity and the training required are not specified in the report). Several Member States and industry associations are facilitating training sessions and set up installer certification to address this. However, despite these difficulties stakeholders see sufficient reasons to continue with the installer package label because of its unique merits in promoting solar devices and other hybrids.

Other, solar specific, issues are:

- In several Member States the governments do not require applicants for solar thermal subsidies to use the EU labels and/or they require other qualifications (e.g. Solar Keymark). This, and the fact that subsidies for solar thermal have been reduced in several Member States, does not help the uptake of the EU label in the heating market.
- As solar devices are particularly suited for warmer climates (e.g. South of France, Spain, Italy, Greece, Portugal) there are voices advocating to show not only the performance in an Average (and Cold) climate on the label but also in the Warm climate zone (compare Energy Label Room Air Conditioners), also because labelled performance is lower than achieved in reality for these customers.
- In certain Southern-European countries and especially in holiday homes, small low-cost instantaneous gas-fired water heaters are still popular and it is possible to obtain an 'A+' rating without any renewables. At the same it is often difficult to obtain more than an 'A' in a water heater package with solar thermal. (this is an artefact of the current calculation methodology, a acknowledged flaw; it is intended to amend his in the revision). This does not promote the uptake of solar thermal solutions.
- Solar thermal systems are particularly suited as a retrofit to boost existing heating systems. Solar Heat Europe proposes to allow installers to rate and label such a retrofit situation.

The most recent proposals for water heaters from the impact assessment project are in an interim report published in May 2020[74][75]. This proposal was that the package label be retained but that the method to calculate the contribution of solar devices to the overall water heating efficiency is revised.

COMMENTARY ON THE EXPERIENCE OF THE HEATER AND WATER HEATER PACKAGE ENERGY LABEL FOR OTHER SYSTEM APPROACHES

The heater and water heater package labels have been in effect for over five years. Considerable effort has been expended, by an EC funded project, by MSs and by trade associations, to raise awareness in the supply chain and in consumers and to train the supply chain in their use. The impact to date seems limited: the uptake of the labels is thought to be poor, and compliance is rarely checked (to the extent that the level of non-compliance is unknown).

Some of the factors causing this are specific to heaters and water heaters, and in particular to solar thermal. These are described in full in the reports referenced above but include:

- The fact that most solar systems are retrofitted to an existing heating system, not with a new system so demand for package heater labels (which apply only when a new system is installed) is intrinsically low.
- That the labels are not being used by most MSs for their grant/subsidy programmes, so these are not driving demand.

[74] Water Heaters & Storage Tanks Ecodesign and Energy Labelling, Impact Assessment Assistance to the European Commission, Draft Working Document Inputs, May 2020

[75] This report also includes the suggestion that waste water heat recovery systems be included in the package energy label.

- That the calculations in the current label do not fully and clearly reflect the efficiency gains from solar thermal, and therefore the incentive to create the package label is limited.

However other factors are intrinsic to the package/system approach and would apply to any energy label or ecodesign regulation:

1. **Issue**: The installer requires detailed information about each component of the system to produce the system label (or in the case of an ecodesign regulation, to check and then demonstrate that the system meets the requirements).
   Possible solution: make these component data freely available. Most of these components will be required to make such data available, due to the information requirements of the ecodesign and/or energy label regulation for the 'component' product, and some of them may be in the database of energy labelled products, EPREL. In theory, then, this is straightforward; in practice this is anything but. It can be very time consuming to track down this information and often is it incomplete as the findings of MS and cross EU market surveillance studies can bear witness. (If manufacturers and suppliers can be slow to provide data to MSAs they are likely to be even less helpful to installers). A solution to this would be for some organisation, preferably one with some 'pull' over manufacturers and suppliers, to take responsibility for populating a database of relevant products.
2. **Issue**: The calculation of system efficiency can be complex. The calculation methodology should ideally be transparent and easily auditable, in order to give confidence to consumers and make compliance checking straightforward. Also, installers have limited resources to spend on learning how to do this and then repeating the calculation for every system they try to sell so ideally it should be quick and easy to use.
   Possible solution: to provide a free and freely available calculation tool. This has been done for the package heating label by the EC funded project Label Pack A+ and at least one MS. However the former was not widely used despite free training in the tool being offered. This low uptake could be in part because it was not connected to a database of component performance (point 1) so that it was easier to use.
3. **Issue:** It can be difficult to make the calculation of system efficiency so that it accurately reflects the impact of each component in the wide range of circumstances where it may be applied. (The heat package label illustrates this - despite the fact that package label was designed primarily to encourage the inclusion of solar thermal in a system stakeholders reported that it did not give the efficiency gains due credit. A new calculation methodology is being proposed as part of the regulation revision; it is not certain that this will satisfy all parties.)
   Possible solution: as for point 2, the solution appears to be to use experts to develop a methodology centrally, with input from a wide range of stakeholders (to be certain that no component of the system is being unfairly favoured or disadvantaged), which is then made freely available. There are likely to be trade-offs between fully covering all eventualities, the requirement to be auditable and the resources needed to develop and maintain the tool. The tool could be developed via number of routes: as part of a preparatory, review or technical assistance study or via a separate study commissioned specifically for this purpose.
4. **Issue:** the requirements are difficult to enforce. There have not been any examples of compliance checking of the heating package label reported except anecdotally. It is not clear how to test the performance of an installed system satisfactorily, in a way that is robust and could stand against possible legal challenge by the installer, analogous to testing a product in a laboratory. (Further as noted by EEPLIANT1 it may be difficult for the MSAs to even get hold of the heater package label and associated calculation - as things stand neither the customer nor the installer are required to retain them. The Commission is considering introducing a mandatory Digital Building Logbook. If this is adopted it is possible that this could include requiring the building owner to retain material used in quotes for installation, such as the heater package energy label.).

Possible solution: to date there are no solutions available[76]. That does not mean that none is possible -it may be just that insufficient resources have been spent on considering how to go about this. One reason for this may be that the consultants who undertake these studies rarely have much experience of checking compliance; it is easy to suggest solutions that seem acceptable in principle but which when you have to put them in practice are not feasible, particularly with the limited resources of MSAs.

There is another factor which may mitigate against system regulation; this is a suggestion by the author, it has not been mentioned as a barrier in any of the references reviewed for this work. It is

- **Issue** The obligation for compliance is on the installer, not the manufacturer or supplier. Installers of energy using systems are not accustomed to having this responsibility, with the associated risks and penalties, and may be unwilling to take it on. Installers may be used to being held to account for the quality of an **installation**, for example the way a water heater is fitted in a building, they are not generally responsible for the performance of a system. It may be that the installation is a relatively low proportion of the system cost, so the risk/reward balance is poor for the installer. This risk may be one reason (in addition to ease of use and access to component data) why installers have preferred using manufacturer's tools to calculate the efficiency for the package label – if they are challenged they have the reputation and resources of a large company to fall back on.
  Possible solutions: A freely available, authoritative online calculation tool, as suggested above, may reduce this risk. It may also be possible to develop a specialist insurance product to provide installers with low cost cover for if a label is found to be incorrect or a system does not perform to the required standard if the error was in good faith. An alternative may be to develop other business models, perhaps combining installations with an energy service, or heat as a service model.

ANNEX: THE LABEL PACK A+ PROJECT

The project addressed one of the main challenges related to this particular energy labelling process in relation to other Energy-related Products : the issuing of the package label by installers. This challenge involves the preparation of the industry, retailers and installers to this process, including the communication to the final consumer.

Therefore, the main objectives of the project were to:

- Provide guidelines, as well as standardized answers to clarify the responsibility of each actor in the supply chain. These activities will, in particular, focus on installers and SMEs, who might be facing specific implementation challenges;
- Facilitate the exchange of product fiches and product related information on the format of equipment's databases, available to all the actors in the energy labelling process;
- Apply the energy labelling calculation methodology and make it available to all the actors in the supply chain in the form of a user-friendly online calculation tool;
- Develop and provide industry specific training material, especially focusing on the responsibilities' and roles of installers in the energy labelling process;
- Provide tailor-made information for end consumers, which will either be directly accessible by them, or used by dealers to explain the significance and added value of the "package label";

[76] The contractors on the Building Automation and Control Systems ecodesign preparatory study suggested that the Lifts directive offered a possible model, but a review of the evidence by the author suggests that this is not a good model

- Provide consolidated expertise on the energy labelling process to the Commission and national authorities, based on the experiences gathered on the pilot implementation in the participating countries.

APPENDIX 7: REVIEW OF SOLAR PHOTOVOLTAICS STUDIES

INTRODUCTION AND HISTORY

JRC and TNO undertook an ecodesign and energy labelling preparatory study on Solar Photovoltaics (Solar PV) from October 2017 to December 2019. The study was also intended to develop criteria for Green Public Procurement (GPP), and the EU Ecolabel but the researchers used the Methodology for the Ecodesign of Energy-related Products (MEErP) which is standard for ecodsign preparatory studies. The final report for the study was published in December 2020[77].

JRC published a separate preliminary report on options and feasibility of EU Ecolabel and GPP criteria for solar PV in January 2021. (This will not be considered here as voluntary requirements operating quite differently to mandatory requirements, such as ecodesign and energy labelling, so this is outside scope.)

This has been following by a supporting study by JRC; there is no separate web page for this study and the intended timetable is not known. A study stakeholder meeting was held in November 2020. The JRC study team were asked if there was a tentative timetable for adoption of regulations – they replied that they were not aware of one; in their opinion, the soonest these regulations could enter into force would be by 2023.

FINDINGS OF PREPARATORY STUDY

ISSUE RE ELIGIBILITY OF ENERGY LABEL FOR SOLAR PV

There is a legal issue around the adoption of energy labelling regulations for solar PV which has yet to be resolved: the regulations (the energy labelling framework directive) state that the energy label has to consider the energy performance of the appliance/system in terms of energy consumption; in this case the intention would be to label the performance in terms of energy generation. If the legal opinion is that an energy label for generation is not eligible under the framework directive then this may require an amendment to the framework directive or the development of a separate stand-alone energy label regulation for solar PV. Either option would delay the adoption of regulation.

PROPOSALS FOR REGULATION

The preparatory study considered two approaches for an energy label[78]:

- A simplified package approach, based on component efficiency, with the package provider taking responsibility for calculating the Energy Efficiency Index (EEI) and the resulting label
- A systems approach, where the product performance reflects site conditions, with the installer taking the responsibility for calculations and label.

(There were also proposals for performance and informational ecodesign requirements but these were for components, modules and inverters, so are not considered here).

[77] Dodd, Nicholas; Espinosa, Nieves, Van Tichelen, Paul Peeters; Karolien, Soares; Ana Maria, Preparatory study for solar photovoltaic modules, inverters and systems, EUR 30468 EN, 2020

[78] NB The energy label was proposed only for systems mounted on residential buildings.

The latter is more complex, requiring more input data and a calculation tool, but the study found that the potential energy gains are greater: 15.8 TWh[79] from the system approach vs 10.4TWh[80], both in 2050, from the package approach[81].

The preparatory study recommended a system label, with the system based EEI expressed in units of MWh/kWp.m^2. The researchers developed a transitional method to calculate the EEI[82], which would be made freely available if the proposal was adopted in regulation.

The study report noted that the experience with the use and market surveillance of the only system energy label to date, the heater package energy label, had been unsatisfactory so far, quoting the Task 1 section of the boiler and water heater review study report[83]. It did not offer any commentary on this or on the practicality of generating and compliance checking the system label.

COMMENTARY – DRAWING BROADER POINTS ABOUT A SYSTEMS APPROACH FROM THE EXPERIENCE OF SOLAR PV TO DATE

Development of regulations for solar PV are still in the relatively early stages, with a supporting study currently under way. The current proposals are for a systems approach to be taken for an energy label for residential systems, alongside ecodesign requirements for the components, somewhat analogous to the heater package energy label.

The proposal has many elements in common with other systems approaches considered in this review:

- Energy gains from adoption of the systems approach are estimated to be higher than from a simpler, components approach.
- A transitional method (calculation tool) is required to calculate the key system metric (in this case the EEI). In this case this has been developed by the authors of the study, JRC.
- The calculation requires easy access to both the performance of the system components and the situation of the system (solar climate; shadowing, orientation, and inclination of the solar panel). There are relatively few components in the system (compared to say, a lighting system or BACS) and the intention is to place information requirements on performance under ecodesign regulations. Nonetheless experience with the package heater and water heater energy label has shown that easy access to the component data can be a substantial barrier.
- The system efficiency calculation and the energy label would be the responsibility of the installer (whereas in component regulations they are the responsibility of the manufacturer/supplier.)
- The challenges arising from market surveillance of a system approach have not been fully addressed.

[79] Figure 158 in the prep study report

[80] Figure 156 in the prep study report

[81] These estimates were based on installed capacity per year increasing from 6500MW (p) in 2015 to 31,500 MW (p) in 2050.

[82] Currently a spreadsheet.

[83] Page 414 of the prep study report

APPENDIX 8: REVIEW OF BUILDING AUTOMATION AND CONTROL SYSTEMS (BACS) STUDY

NOTE ON THIS APPENDIX

This review of an ecodesign and energy labelling preparatory study is slightly different to the others; this piece of work in that it was written before the study was completed and in part to assist the European Copper Institute in drafting their response to the draft preparatory reports.

STATUS OF PREPARATORY STUDY AT TIME OF REVIEW (11TH JANUARY 2021)

- Draft versions of all the task reports had been published, although Task 7 report incomplete. (NB Consultants not been able to resolve all issues in this study – further work would be necessary before a regulation could be drafted.)
- Final stakeholder meeting 15 December 2020; stakeholder comments due 20th January
- Consultants' contract ends 31 January 2021

OPTIONS FOR ECODESIGN AND ENERGY LABELLING MEASURES

The draft Task 7 report (policy and scenarios): suggests a series of requirements. These requirements can be applied to:

1. 'packaged products', components of BACS. These are products which are sold and can be tested as units
2. 'installed products'. These are complete systems

The report states that the majority of the potential energy savings will derive from the suggested 'installed product' requirements. Preliminary estimates of savings in 2040 from minimum requirements for installed products are:

- 184TWh from a minimum requirement of class B systems (EN15232 energy performance class[84])
- 272TWh from a minimum requirement of class A systems (section 7.2.3)

These are to be compared with 68 or 112 TWh from different requirements for packaged products only; with the reference scenario assuming that the BACS placed on the EU market initially have the same level of energy performance as new BACS sold in 2020 and improve over time in response to the anticipated impact of Member State implementation of the measures in the revised EPBD.

Further, if Ecodesign and Energy Labelling required the specified information on BACS installed products this would make it easier for Member States to set requirements for BACS under the Energy Performance of Buildings Directive[85] (EBPD).

The rest of this report is concerned only with 'installed product' requirements.

[84] The EN 15232 standard on the impact of Building Automation, Controls, and Building Management was used throughout the study for scope and performance definitions. There are four performance classes in the standard: from Class D, non-energy efficient BACS to class A, high energy performance BACS and Technical Building Management.

[85] Lines 929 to 940 in task 7 report

[Author's note: During a teleconference[86] with one of the study team members, Alan McCullough of Ricardo, he suggested that at present many BACS are incorrectly installed or operated eg:

- Sensors not installed, incorrectly installed or installed but not connected
- The components specified in the design are not installed (cheaper versions with poorer performance used)
- Systems are not switched on

This is not remedied at commissioning because the organisations who purchase the systems do not have the expertise to check that the installation is as specified, or that the system is operating correctly. **This implies that the performance gap for BACS may be greater than used in the modelled scenarios and therefore that the scope for savings may be greater**. This also suggests that whatever standards are set compliance will initially be low and an extensive training and communications programme will be needed for the regulations to be effective. Further this will need to be backed up by compliance checking and penalties imposed by Market Surveillance Authorities (MSAs).]

The suggestions for performance requirements for installed products are:

- Ecodesign: Specific BACS energy performance limits (C, B or A) at the installed product level
- Ecodesign: Specific BACS internal power consumption limits at the installed product level
- Ecodesign: Specific BACS minimum functionality requirements at the installed product level
- Ecodesign: Lifetime requirements at installed product level

The information requirements in principle are:

- Ecodesign: Generic BACS information requirements at the installed product level on
    - energy performance
    - demand response
    - interoperability and operation and management characteristics
- Energy Label: BACS energy performance at the installed product level (EN15232 class A, B or C)

The major difficulty in drafting regulations for any or all these requirements is finding a route for market surveillance of an installed system. This is critical for adoption and implementation both in principle and also, given the reportedly poor performance of installed systems, in practice - to increase the effectiveness of installed BACS.

The only precedent for a system approach under Ecodesign and Energy Labelling to date is the package label for domestic heating, where the installer is required to give a package energy label for a system involving several components (this will be considered in a separate report).

The principle of the approach is that the installer would certify the components, installation and operation of the installed system, including the overall energy performance class to EN15232. The study authors suggest that the most effective way of doing this would be an online database of performance and functionality of components, which can supply data to an online tool which calculates the system performance. The component database could be similar to existing databases which some Member States have developed to allow ratings for Energy Performance Certificates to be calculated (the database in Belgium is given as an example).

[86] With Fiona Brocklehurst on 21 December 2020

[Author's note: It could be difficult to populate such a database; the compliance of component suppliers would need to be high for this to be useful and this in itself presents another, separate compliance issue. Anecdotally manufacturers/suppliers etc have been slow to populate the European Product Database for Energy Labelling (EPREL) despite a considerable time to comply and the potential threat of having their products removed from the market if they do not meet their obligations.]

A free online tool for designers and installers would need to be developed.

In the task 7 draft report the Lifts Directive (2014-33) is quoted as an operational example of the approach that the contractors are suggesting for BACS (lines 332 to 335, lines 689 to 690 and lines 976 to 948 of the Task 7 report). This approach is demonstrating compliance of an installed product by a qualified Notifying Body applying a CE marking. An outline of this and discussion of its wider applicability is in the section below.

EXPERIENCE FROM THE LIFTS DIRECTIVE 2014-33 (AND PRECURSORS)

The Lifts directive is intended to ensure that essential health and safety requirements (EHSRs) of lift are met. There are similarities with BACS in that the installation and operation of the product is customised to each building and that the specifics of the installation are critical to satisfactory operation.

In addition to the text of the regulation the Commission provides a detailed (193 page) application guide[87] expanding on and clarifying the text.

The Directive operates via a process of certification of installation by Notified Bodies (NBs). Once a NB is satisfied that the regulations requirements are met they issue a CE marking for the life installation which should then be displayed in the lift. These NBs are required in most MSs to be accredited by an appropriate National body[88]. An installer can use a NB from any MS.

There are different routes to certification; for example NBs may require technical documentation for the design and installation of the lift and an in-person inspection of the lift including prescribed functional tests. They may also require continuing access to the documentation and the lift for surveillance visits (which, for example are held at annual interval as a minimum[89]).

Thus Market Surveillance Authorities (MSAs) have should existing material to work from, the documentation required by the NBs, when they check compliance, and they could repeat the functional tests that the NBs required at installation and periodic review. However an evaluation of the Lifts Directive[90] found that market surveillance was a concern: most stakeholders in a

[87] GUIDE TO APPLICATION OF THE LIFTS DIRECTIVE 2014/33/EU, May 2018 https://ec.europa.eu/docsroom/documents/29961

[88] For example in the UK this is the United Kingdom Accreditation Service https://www.ukas.com/

[89] Lift Cert scheme rules under the LIFTS DIRECTIVE 2014/33/EU and the SUPPLY OF MACHINERY (SAFETY) REGULATIONS 2008, 2018, http://liftcert.co.uk/documents/nbscheme.pdf

[90] Evaluation of Directive 95/16/EC on the approximation of the laws relating to lifts, Final Report, November 2017, https://op.europa.eu/en/publication-detail/-/publication/9f1a5907-e539-11e7-9749-01aa75ed71a1/

survey felt that market surveillance was not fully adequate[91]. The evaluation identified a number of barriers to good market surveillance including:

- Limited financial and human resources in the MSAs, in particular the skills to identify whether specifically products conform to standards and
- it is difficult for MSAs to know when and where a new lift is placed on the market[92].

Despite this the evaluation found that the Directive was effective. Amongst the key findings were:

- Lift non-compliance is low
- NBs play an important role in ensuring the effective application of the Directive as they act as "ultimate controllers"
- The accreditation process of NBs is different across the EU, although this situation will improve through the alignment to the New Legislative Framework
- On average, compliance costs entailed by the Directive were quite marginal

RECOMMENDATIONS FROM THE LIFTS ECODESIGN PREPARATORY STUDY

An Ecodesign Preparatory Study for Lifts[93] was completed in October 2019. The study found that no specific policy regulations on the energy efficiency of lifts could be identified in the EU or in other countries; only voluntary labels. Two Member States, Denmark and Portugal, had set mandatory energy performance requirements for lifts when implementing the EPBD, using an existing measurement standard ISO 25745-2 or VDI 4707.

The study identified the difficulty in applying the ecodesign approach 'given that lifts are a system that only formally comes into being when they are installed' and recommended that regulations for lift energy efficiency should be addressed via the EPBD.]

COMMENTARY ON ADOPTION OF SYSTEMS APPROACH IN BACS BASED ON EVIDENCE TO DATE

SCOPE FOR SAVINGS

It is clear from the study report and the telecon with Alan McCullough that there is extensive scope to improve the effectiveness of BACS with substantial energy savings thought to be available and most of these to come from setting requirements for installed products (a system approach) rather than packaged products (components).

COMPLETENESS OF PREPARATORY STUDY

The draft preparatory study report is incomplete (for example the impact calculations are not finalised and there is no summary for task 7) but even once this is done the study has not been able to progress to a point where the authors can make recommendations on draft regulations. The existence of an international standard for the performance of BACS, EN 15232 was essential for the preparatory study to make as much progress as it has but

[91] Figure 33 in the report shows 25% of survey respondents felt this was ineffective, 53% somewhat effective and 22% effective.

[92] Although in some countries NBs have to inform the competent authority when they issue a certificate.

[93] https://www.eco-lifts.eu/

this is not enough; substantial work is needed before that is the case. The study authors state that developing transitional methods in a number of areas would be necessary, namely:

- On measuring and reporting Key Performance Indicators (KPI)s (lines 477-478 and 759-760 Task 7 report)
- On assessing the compatibility of components with BACS (lines 497-498 and 872-873 Task 7 report)
- On declaring installed products to be Demand Reduction (DR) or Smart Grid (G) compatible (Annex B of the task 7 report).

ENSURING COMPLIANCE

A key proviso for the practicality of regulating installed products (ie systems approach) is to find a mechanism for MSAs to check compliance with the regulation. The study team put forward the Lifts Directive as an example of a regulation of an installed system. The evaluation study of the Lifts Directive found that most stakeholders thought that MSA checking of compliance was not fully adequate. Despite this lack of the level of non-compliance with the Lifts Directive was thought to be low.

The author considers that there are reasons for the low level of non-compliance despite inadequate compliance checking by MSAs which would not be transferable to BACS. The most important of these is that safe operation is an essential attribute of a lift and the major concern of the Lifts Directive. If lifts fail the human, financial, legal and reputational penalties for the operating organisation and for the Notifying Body that certified the installation could be severe. These are very strong reasons for all involved in the supply chain to conform, to check that they have conformed and document their conformity. By contrast the consequences for a BACS not meeting regulatory requirements are relatively minor.

Other, secondary, differences include:

- the function of a lift is simply defined and is the same from building to building; BACs can have complex functions which can vary a great deal from building to building
- lifts are located in one space, whereas BACS components can be widely distributed through a building, making them more difficult and time consuming to check
- software comprises a relatively small part of a lift system but can be a critical and substantial component of BACs; the performance of software can be difficult to measure consistently.

The author does not consider that the Lifts Directive is a good archetype for ensuring compliance of Ecodesign or Energy labelling regulations for BACS installed systems and therefore that the preparatory study adequately addresses the issue of how to address compliance.

SUMMARY

The draft reports make clear the advantages, in terms of energy savings, of regulating installed products but leaves important issues to be addressed, the most critical being how to check compliance of BACs with regulations.

ANNEX: BACS PROVISION IN EPBD

There are currently BACS (more correctly Technical Building System) requirements in the EPBD but the implementation of these is thought to be inconsistent. A technical assistance study (https://ec.europa.eu/energy/studies_main/preparatory-studies/technical-assistance-study-ensuring-optimal-performance-technical-building-systems-under-energy_en) to develop and disseminate technical guidelines to support the effective establishment and enforcement of requirements has started but had not produced any deliverables by mid-January 2021.