Eco Design Preparatory Study - Building Automation and Control Systems (BACS) -Summary and brief for members

Status

In accordance with Article 15 of the Eco-design Directive 2009/125/EC and the 2016-19 work plan, a preparatory study on BACS has been launched. Led by VITO, the same consultants leading the work on Lot 33 and the EPBD Smart readiness Indicator. It is based on the Methodology for Eco-design of Energy-related Products (MEErP) https://ecodesignbacs.eu/faq .

The initial study undertaken for the 2016-2019 eco design work plan is available here. http://ec.europa.eu/DocsRoom/documents/20374. This outlines more detail on their assessment to support the need for a preparatory study for BACS.

VITO have recognised that the launch of the BACs study is timely to compliment the on-going studies addressing the development of a smart readiness indicator for buildings and smart appliances under Lot 33.

This first part of the preparatory study (scope development) was started mid October 2017 and is expected to be completed in March 2018. Reports and other related documents will be published on the study website https://ecodesignbacs.eu/

The initial scoping work will include the following:

- define the product group(s) and system boundaries with options for scoping a full preparatory study;
- screen the products considering the environmental impacts and potential improvement as referred to in Art. 15 of the Eco-design Directive, but also considering any systematic differences in application areas, e.g. residential vs non-residential;
- identify the areas where the MEErP might need deviations, including producing proposals for alternative approaches that follow the MEErP as closely as possible, e.g. how & where the MEErP needs to be adapted for this product group;
- deliver an overview of suitable policy options in light of the Eco-design Directive, but also in view of the complementarity with the work on the EPBD, smartness indicator and smart appliances (i.e. demand side flexibility from BACS).

What are BACS and implications for BEAMA members?

As outlined by VITO, BACS are electronic appliances that manage and control the operation of most technical building services such as heat generation, hot water systems, ventilation, cooling and air conditioning, lighting, communication systems, lifts, etc. The official definition for BACS and related Building Management Systems (BMS) is provided at the back of this paper, as published in EN15232.
BACS cover a wide range of heterogeneous products for which the significant energy saving potential is due to their interaction with other products/systems. The preparatory study for the 2016-2019 eco design working plan identified that the main energy savings for BACS are not achieved in reducing the standalone energy consumption of the BACS themselves, but are driven by the coordination of several controlled products with BACS e.g. preventing heating and cooling in the same zone at the same time.

BACS functions as a control loop that consists of a sensor, an actor (valves or actuators) and a controller that executes the logics. The main components considered so far in the work plan are

- Duct temperature sensors/ immersion temperature sensors
- Automation stations/ controllers
- Valves and actuators

Scope and likely focus of the preparatory study as indicated by the initial review in the 2016-2019 work plan documents

Task 3 of the initial work plan considered the ***energy consumption and material efficiency*** of BACS (file:///C:/Users/yselklaf/Downloads/Ecodesign%20WP3_Task_3_Final_Report_10022015.pdf Page 53 -61)

BACS can save energy related to one or several building services (ventilation, lighting, space heating and hot water etc). There are two kinds of energy saving when using BACS;

1. Standalone energy saving - due to the use of an independent control product
2. Energy savings due to coordination of sever control products within BACS – this is for example preventing heating and cooling in the same zone at the same time.

Data on the estimated energy saving potential using BACS in non-residential buildings was sourced from the 2013 European Copper Institute study. It seems this is the only source used to collate data on BACS for the work plan. According to this study the average savings per commercial/ public buildings would be in the order of 37%. HVAC systems are likely to achieve the highest savings from the introduction of BACS. Overall the efficiency of the system is reliant on the design, commissioning, installation and maintenance, and can vary across different products, therefore justifying a potential measure under eco design or energy labelling.

Task 4 of the initial work plan looks at the ***environmental impacts*** of the product group, this includes water consumption and health, and key elements of the product that may contain critical raw materials (printed circuit boards), presence of flame retardants (halogens contained within valves and actuators in cables and insulated tubing for examples), plastic parts, durability.

Suitability of eco design measures or energy labelling

Eco design or energy labelling regulations could be implemented to increase the efficiency of BACS and reduce further the environmental impacts of non-residential buildings.

There are believed to be sufficient differences of functionality and performance between different control products on the market to enable the use of a label. E.g. the product certification and labelling scheme developed by eu.bac aims to assure a high level of performance of the products and systems and could be used and made compulsory using Energy labelling to increase its efficiency.

Eco design could help reduce the environmental impacts by:

- Setting minimum requirements on the sensitivity and permitted tolerances of control products (sensors and actuators)
- Increasing the user friendliness and helping BACS to be better installed and operated (as this is known to affect their efficiency). This could include measures for the display, using alerts related to check lists for installations, or alerts when extreme energy losses occur.
- Increasing the re-commissioning of the system; e.g. an alarm could alert the user that the efficiency of the system needs to be reassessed.
- Strengthening the interoperability; communication protocols can be different from one system to another which effects the capability of all systems to work together.

The conclusions of the work plan review stated that eco design and the energy labelling regulation were a suitable and cost-effective tool to reduce the energy and environmental impacts related to the use of BACS.

Current Policy Coverage

Currently BACS are covered **by WEEE, RoHS, REACH and EPBD.** The EPBD aims at maximising the benefits of using BACS, whereas WEEE, RoHS and REACH aim at reducing the environmental impacts of BACS.

The recent re-cast of the EPBD under the Clean Energy Package includes amendments to article 8 which will stimulate the further demand for BACS. Also the Smart Readiness Indicator outlined in the new EPBD is likely to drive the uptake of BACS. This is to be reviewed alongside the preparatory study.

Existing Industry self-regulatory initiatives - Product certification scheme from eu.bac.

The European Building Automation Controls Association (eu.bac) has built a product certification scheme for the rated performance of building controls equipment tested under EN 15500/ISO 16484-3. The scheme has been complemented with a voluntary product energy labelling system. **Certification of BAC systems and components is based on their potential capability to reduce energy consumption**. The certification is performed in accordance with the rule of the eu.bac mark scheme for products and systems for home and building automation, that includes the conformity testing of the products, checking of the manufacturer's relevant production line quality management systems, inspection of the product location, and market surveillance. The certification procedure requires periodic tests of the products and systems and inspection by third parties.

The eu.bac labelling scheme is based on a scoring system and includes 6 classes from AA to E. eu.bac includes on a dedicated website a list of certified products with their energy classes. www.eubaccert.eu.

Eu.bac has also developed a certification scheme (eu.bac System) that provides certification of the energy performance of BACS for a whole building, at the first delivery and throughout its lifetime. This certification based on the EN15232 standard takes into account the whole control system and estimates its quality and efficiency according to a normalised scale from 0-100.

This certification method provides guidelines to energy efficiency functionality, provides a mechanism to check that a BACS installation actually includes the expected functionality, and that with periodic inspections the functionality provides equal or better performance over time.

BEAMA assessment and initial comments

There is some history behind this work and the likely inclusion in eco design which BEAMA members need to be aware of. Going back to work on Lot 1 and attempts to introduce bundling of controls under eco design, EU trade bodies specifically eu.bac have been campaigning since then for the Commission to treat Building Automation and Controls as one product group. This preparatory study is the outcome of these discussions and what we see as an evolution in the use of Eco-design and energy labelling regulation to apply measures to systems and packages of products. This study therefore has significant implications for a range of BEAMA member product groups, including but not be limited to:

BEAMA heating controls - here the primary business is the manufacture of heating and hot water controls for residential, although the products themselves can be used in non-residential application and as component parts for ta BACS or BMS. BEAMA anticipate a BACS eco design or labelling measure will have implications for members businesses.

BEAMA ventilation – here most members make or supply ventilation controls (residential and non-residential). Many of these are built into the ventilation units rather than separately but there will be elements of communication so that the units, certainly larger Air Handling Units, can be incorporated into a building automation system . There may be interest here with regards to how BACS could contribute to improved indoor air quality. BEAMA anticipate a BACS eco design or labelling measure will have implications for members business.

BEAMA Connected Homes - primary interest in the3 BACS study will be on communications and integration of building services/ management systems. Should the scope of the BACS study extend to load control as well as energy efficiency then this group will have an interest to ensure the scope is complementary to the decisions already being made for the SRI and lot 33.

Building Electrical Systems portfolio - It is believed members of this portfolio will have an interest in this study due to the components potentially covered in scope (actuators, sensors valves).

Overall there will be a cross BEAMA interest in this due to the likely implications for integrated products with BACS systems, and also the potential for material efficiency standards for components. This interest will be dependent on the how far the scope extends.

Routes to market

In the case of package labels and bundling of products for systems, this has come up in the past for space heaters and controls under the Energy labelling regulation. This has been handled to ensure the efficiency rating of combined products can be evaluated at point of installation, and a label applied to the package. This has come up again, more recently, under Lot 33 and the preparatory study for smart appliances where BEAMA are campaigning to keep products with external 'controllers' in scope

of this study. Although in the case of Lot 33 the issue is slightly different as we are considering the enabled functionality of Demand Side flexibility by the 'controller', and therefore are not considering energy efficiency. In the case of the BACS study similar discussion will arise as BACS not only improve the energy efficiency of systems, but can also act as an enabler for DSF and other 'smart' functionalities in a building. In this instance VITO are acknowledging the links BACS will have to the final Energy Performance in Buildings Directive and the Smart Readiness Indicator (SRI), as BACS are potentially viewed as a key 'fixed installation' in this case, and would contribute to the 'smart readiness' of a property.

BEAMA foresee the BACS study and EPBD SRI to be very much linked. They are being overseen by the same VITO team and you might anticipate the final policy recommendations from this study providing a regulatory mechanisms to drive the applications of the SRI. It is hard to tell at this stage but in our work we should maintain a focus on all related aspects as the Commission are pursuing a number regulatory mechanism to deliver on their objectives in the Clean Energy Package.

Questions for members

The stakeholder meeting on the 17th of Jan 2018 presents an opportunity for BEAMA members to guide the overall scope of this study and draw some lines with regards to what we want/ don't want from this. Catching this at an early stage is key and BEAMA have a good relationship with VITO to help steer this. Members are asked to agree a position on expected scope ready for 10th Jan.

The main focus of our position for January will be on understanding and quantifying routes to market for controls and building automation equipment and where product regulation would usefully be applied or not.

- Do you think the delivery of product regulation under eco design or energy labelling regulations would benefit the market for BACS?

- Drawing on our experience of packaging labels, could this framework be appropriate for BACS? If yes, how should this evolve to accommodate for systems and more complex products like BACS?

- Could a measure under eco-design or energy labelling complement or conflict with existing industry self-regulating initiative (e.g. eu.bac certification scheme).

- Should the scope of this study cover Non-residential and residential BACs applications?

- Should the scope of this study be extended to consider Demand management as well as Demand reduction, acknowledging the future role of BACS to facilitate demand side flexibility services in buildings?

- There is likely to be a strong focus on material efficiency standards for the reusability, recyclability of component elements of a BACS - as a manufacturer of these component parts how feasible would you view this? Some examples of this are listed below (as outlined in the work plan):
    - Setting minimum requirements on the sensitivity and permitted tolerances of control products (sensors and actuators)
    - Increasing the user friendliness and helping BACS to be better installed and operated (as this is known to affect their efficiency). This could include measures for the display, using alerts related to check lists for installations, or alerts when extreme energy losses occur.
    - Increasing the re-commissioning of the system; e.g. an alarm could alert the user that the efficiency of the system needs to be reassessed.
    - Strengthening the interoperability; communication protocols can be different from one system to another which effects the capability of all systems to work together.

- Do you agree with the current assessment of what a BAC system is, as outlined at the start of the BEAMA paper? Are there other components / products potentially in scope that may be affected that we have not considered?

Related test standards

EN15232 'Energy performance of buildings - impact of building automation control and building management' – aims at supporting the EPBD. This standard specifies methods to assess the impact of BACS and technical building management (TBM) functions on the energy performance in buildings.

Definitions – as outlined in EN15232

Building Automation and Controls: Description for products, software and engineering services for automatic controls, monitoring and optimization, human intervention and management to achieve energy-efficient, economical and safe operation of building services equipment.

Building Automation and Control Systems: Comprising all products and engineering services for automatic controls (including interlocks), monitoring, optimization, for operation, human intervention and management to achieve energy-efficient, economical and safe operation of building services.

Building Management: Totality or services involved in the management operation and monitoring of buildings (including plants and installations). Building management can be assigned as part of Facility Management.

Building Management System: Building automation and control system. Energy management is part of technical building management, part of a BMS.

Building energy management: Comprising data collection, logging, alarming, reporting and analysis of energy usage etc. The system is designed to reduce the energy consumption, improve the utilization, increase the reliability and predict the performance of the technical building systems, as well as optimize energy usage and reducing its cost.

BACS provide effective control functions of heating, ventilating, cooling, hot water and lighting appliances that lead to improved operational and energy efficiencies.

EN 15500 – product standards for electronic control equipment in the field of HVAC applications

EN ISO 16484-3 'standardisation of BACS functions, used to assess the impact of BACS on energy efficiency.

EN ISO 16484-5 - open data communication protocols for BACS which is necessary for the integration functions with BACS impact on energy efficiency

EN ISO 16484-7 – specification requirements for integrated systems

Other coms standards - KNX, Zigbee, Wifi, ZWave etc