



Strategic Priority 3: BAUKULTUR

Environment & Sustainable Architecture WG

Smart Readiness Indicator

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BACKGROUND

In application of Article 8 of the revised Energy Performance of Buildings Directive¹, the EU Commission is currently developing a Smart Readiness Indicator (SRI), meant as an optional EU scheme to "*measure the capacity of buildings to use information and communication technologies and electronic systems to adapt the operation of buildings to the needs of the occupants and the grid and to improve the energy efficiency and overall performance of buildings*". By 31 December 2019 the Commission shall adopt a delegated act establishing the SRI.

DG ENER has commissioned to external consultants to prepare two preparatory studies aiming to investigate the possible scope and characteristics of the SRI. A first preparatory study was published at the end of August 2018². A second study, started in 2019, will deliver the technical inputs needed to refine and finalise the definition of the SRI and the associated calculation methodology. It will also explore possible options for the implementation of the SRI.

DG ENER has set up a Stakeholder Group (of which ACE is a member) to follow up the work of the external consultants in charge of the studies and provide feedback on draft documents. A Stakeholder engagement workshop was held on 26 March 2019 outlining the next steps for this work. Dr Judit Kimpian, Chair of ESA WG was invited to participate both in the high level and the focused stakeholder workshops set out for this stage.

The present document includes the position that ACE developed at the time of the first preparatory study (from page 4) as well as comments and recommendations taking into account the latest report and stakeholder workshops of March 2019.

ACE DRAFT POLICY POSITION

ACE welcomes the inclusion in the revised EPBD the definition of control mechanisms for technical building systems and proposals for a framework to better target the performance of these. ACE also commends the Commission's intention to catalogue the control capabilities of the system types that supplying each energy end use, in the context of the rapid growth of digital automation technology.

The 2018 revision of the EPBD states that automation promises better indoor comfort and air quality at lower energy use and carbon emissions. While automation has many advantages, there is ample evidence that issues with control systems are a major contributing factor to the energy performance gap. ACE finds it a matter for concern that the assessment carried out by the SRI study, to quantify the potential impact of SRIs, appears to assume that the system capabilities listed are all enabled and fully operational, which building performance evaluations have shown to be rarely the case.

¹ Directive 2018/844/EU: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1529394717053&uri=CELEX:32018L0844>

² <https://smartreadinessindicator.eu/milestones-and-documents>



If smartness is regarded by the EPBD as a panacea for achieving better indoor environmental quality at nearly zero energy use, in practice, this often happens to the detriment of investment in simple passive architectural measures. Higher than expected energy consumption in buildings is often attributed to the growing complexity of technical systems. Better regulation is needed to ensure that the construction sector plans adequately to eliminate the risks associated with automation and complexity in building systems.

ACE supports the detailed review of smart capabilities and recommends that the current phase of the SRI study, and any proposed rating system, fully recognises the risks, as well as the benefits of increased automation in buildings.

Rewarding complexity

According to the current proposals, the SRI rating given for any technical system capability is based on its level of automation, which in practice relates directly to its level of complexity. The current proposals for SRI therefore reward complexity without strengthening much needed mechanisms to address its risks. This is a major challenge to the credibility of the SRI and could further undermine the reputation of the EPBD. ACE urges the Commission to find ways to safeguard investment in construction and renovations from the potential mis-selling of systems and services via SRI ratings.

The absence of a regulatory requirement to predict and validate energy performance in use has left the construction sector without the checks and balances to make provisions for realistic systems design, specification, installation and commissioning. The result is that the mechanical and electrical (M&E) construction package is already considered to be of the highest risk in building contracts. This means that building end users and operators are all too often left with technical systems that are not sufficiently integrated into the overall design of a building, that are absent or not working as envisaged – all of which has serious consequences for energy consumption, indoor environmental quality and occupant well-being.

The EPBD states that the SRI “should give confidence to occupants about the actual savings of those new enhanced-functionalities”. To avoid the SRI rewarding ‘complexity without merit’, **ACE maintains that the framework needs to create credible incentives for the automation sector to address the additional burdens and barriers affecting the professional design integration, installation, commissioning, operation and maintenance of automated technical systems and controls.**

Validation of performance – quality assurance

The most notable of such barriers is the lack of market incentives for the comprehensive integration and commissioning of technical systems and their controls. The validation of system performance is assumed to be an essential component of commissioning and handover, but due to the complexity of the process and fragmentation of responsibilities it rarely takes place in full and in practice most control systems encounter problems from the very beginning of operation.

Key to any quality assurance framework for building systems and controls is the reconciliation of readings from sensors, meters and sub-meters with on site, as well as remote access BMS logs of such data. Without such early validation of their capability in use, building systems cannot be reliably managed and incur exponential maintenance costs during their use cycle.



Such reconciliation is not only the cornerstone of benchmarking, diagnostics and occupant engagement but is also the key enabler of cost effective energy performance contracting. In the 2018 revision of the EPBD, energy performance contracting is referred to as a proven mechanism for achieving significant improvements of energy performance in-use. Moreover, benchmarking, logging and communication of performance data for system optimisation and user engagement, as set out in Article 14/15 para 4b, can only be accomplished reliably once such a reconciliation has taken place.

By incorporating the 'reconciliation' of readings instead of commenting on the theoretical capabilities of systems, the SRI ratings have the potential to become the much-needed quality assurance scheme for the design and commissioning of building systems and their controls. The SRIs, covering the controls of all technical systems in a building (as defined by the 2018 EPBD revision), should be rating their 'reconciled' or 'validated outputs' performance to ensure that EU energy and carbon savings, amounting to annual investments worth billions of euros, are realised.

ACE argues that current proposals to base the third (long term) use of the SRI on measured data, along with the reconciliation process, must be brought forward and integrated into every level of the SRI rating scheme.

Complexity of the SRI evaluation

The SRI currently evaluates delivered services in 11 domains, which are assigned achievement levels of 0-4 then weighted by criteria A-H (services, feasibility, information etc) using a points system (0-100), after which these are weighted by impacts to arrive at a single A-G rating. ACE is concerned that the high number of steps in the assessment steps could lead to highly subjective and variable results. Even the streamlined proposals require the assessment of 52 services in less than a day, raising concerns about the quality achievable for such a complex evaluation, in such a short time. In addition, ACE believes that a single final rating would conceal any useful information relating to the capabilities of systems to manage themselves and interact with occupants or the grid.

While the case study described by the SRI report tested the time required to 'score' a building, it did not take into account the time required to source the relating documentation, including control strategy and 'as-built' information on systems. In our experience this is one of the most time consuming tasks involved in 'reconciliation'.

ACE argues that automation is not necessary to achieve the purposes of the SRI. However it is necessary to receive correct feedback from sensors and meters, to facilitate professional oversight of these readings, to ensure that the level of performance envisaged is achieved.

The impact categories include: energy savings on site, flexibility for the energy grid and storage, self-generation of energy, comfort, convenience, well-being and health, maintenance and fault prediction, and information provided to the occupant. KPIs for these could include daily and annualised energy end-use consumption, energy balance, and indoor environmental quality, as defined by the EU LEVEL[s] programme. Any faults and shortcomings in the systems would manifest themselves as anomalies in these indicators and if these are presented in an accessible format that can be benchmarked, they would prompt the necessary investigations and actions on behalf of the owner/occupant/building operator.



ACE values the detailed mapping of the currently available automation features to achieve improved indoor environmental quality with less (and decarbonised) use of energy. However **ACE recommends that the SRI framework rates the validation and communication of key performance indicators for each impact category rather than the presence of system properties that enable these.** The purpose of SRIs should not be to prescribe *how* to achieve these indicators but to ensure that they *are* achieved, so that the automation market is incentivised to innovate more robustly.

As the technologies are likely to continue to evolve rapidly, the current approach poses a high risk of SRI obsolescence. On the other hand, incentivising robust and ideally automated feedback on the KPIs would be a major step towards closing the energy performance gap and improving the credibility of the EPBD. In this way the catalogue of services and functionalities would become live guidance and in some cases CEN standards.

Uptake

Challenges and opportunities have been identified by the extensive work undertaken as part of the development of SRIs. The direct beneficiaries of SRIs are the automation industry, electric mobility sector and energy providers. However the capital and maintenance costs of smart systems and their evaluation are met by building owners and end users. To these investors, the only direct benefit is the quality assurance potentially granted by the SRI for low energy use, greater comfort and ease of maintenance. There is currently no such quality assurance scheme in place although in some member states independent commissioning officers are mandatory for buildings above a certain size.

ACE recommends that a detailed evaluation of the expected benefits of SRIs is carried out and that easy entry points are identified for each stakeholder. Any guidance for owners, valuers, occupants, designers, contractors and facilities' managers should be based on the feedback from such an evaluation.

The current proposals to rate the theoretical capabilities of technical systems run the risk of being recognised by the market as a box ticking exercise rather than an actual guarantee of systems being installed and enabled to specification. If higher ratings are linked to complexity, as currently proposed, the SRIs risk developing an inverse quality assurance: the higher the ratings the greater the risk of underperformance.

ACE believes that the focus on validation of KPI readings, rather than the theoretical capabilities of systems, is the logical way forward to address the concerns raised at the stakeholder meetings.

Such a common sense approach would remove much of the complexity of the evaluation and solve the problem of the SRIs rewarding complexity. It would immediately strengthen the process of enhanced commissioning and enable performance contracting - the two areas that are recognised as highly effective by the current regulatory framework but lacking incentives for broader uptake. Any guarantee that the SRIs can offer regarding the completeness and quality of sensor, meter, set point and schedule data in buildings would help the transition towards replacing annual on-site inspections with remote ones.

Such a scheme would offer easy entry points even for less technical stakeholders and unlock value for building owners and occupants by ensuring that any technical systems are fully



installed and commissioned while offering feedback on performance. This type of evaluation would present obvious and simple links to the currently evolving Building Passports scheme and lead to a more holistic understanding of what the smartness of a building means.

The above points are based on a detailed review of the Final Report for the Support for Setting up a Smart Readiness Indicator for Buildings and Related Impact Assessment and incorporate the input of the ACE Environment and Sustainable Architecture expert group. In our previous position copied below, we have summarised the principles, which have guided our approach to the indicators.

ACE POSITION DEVELOPED LAST YEAR (First SRI preparatory study)

Data vs functionality:

The focus of the SRI is currently on functionality of the technical system controls. As functionality is expected to evolve rapidly ACE recommends that an operational data centric approach is adopted to build the SRI foundations instead around the following:

- What data will technical equipment need to be able to communicate to whom and in what format?
- How can this data be harmonized between technical systems and BMS?
- What is the minimum information needed to communicate according to what standard to maintenance professionals and occupants?

Holistic approach:

ACE has long argued for the adoption of a holistic approach and welcomed the EPBD's new emphasis on the importance of indoor environmental quality, indoor air quality and passive measures alongside energy consumption. The following questions remain:

- How to ensure that the data collected supports a holistic evaluation of building performance, i.e. records IEQ & occupancy alongside energy consumption and accounts for passive measures such as thermal mass, etc?
- How will the SRI ensure that smart building systems respond to indoor environmental conditions and are able to provide necessary feedback simply to maintenance staff and occupants?
- How will the SRI ensure that such information is added to a digital record of building performance i.e. Building Passport

Business case:

- How will the SRI support the performance disclosure mechanisms of the EPBD?
- How can the data gathered from completed buildings be compared to asset ratings to give credibility to the scheme and improve uptake?
- How will the SRI ensure that smart functionality is actually enabled in installed systems (e.g. requirement for performance-based inspections to enable remote inspections etc?). In its absence where does the SRI highlight the risks that SRI measures do not necessarily mean they are operating optimally
- How can the data generated support benchmarking as prescribed by Article 14 & 15 para 4b and how can such data usefully contribute to the digital management of digital construction information (BIM)?
- How will the data structures conform to those developed by parallel EU initiatives and standards, i.e. CPR, Eco, Level(s)

DATA VS FUNCTIONALITY



1. The SRI must focus on improving the way in which technical building systems can seamlessly communicate useful information to one another, to their operators and to building occupants to overcome design, construction and policy challenges pose by smart systems.

A significant cause of the building performance gap has been shown to be interoperability issues between components, systems and humans (occupants and operators). ACE considers essential a greater focus on communication protocols in order to ensure that owners can at the minimum receive feedback on how their building performs:

- 'energy bars' showing energy consumption by fuel and by end use benchmarked to national standards for each building type;
- feedback on indoor air quality, including temperatures, CO₂ levels, VOCs, particulates and other pollutants, accompanied by a simple interface to provide advice on improvements.

A protocol must be agreed for all technical systems to be able to communicate this information back to a BMS and with one another along with simplified interface for trouble shooting and maintenance.

The SRI should have a more holistic approach to data, focus on accurate aggregation of metering and sub metering, increasingly simplified by a system's intelligent adaptation.

ACE underlines the importance of the life-span of communication equipment and their onerous maintenance costs.

ACE recommendations:

- ACE calls for a simple and standardized reporting protocol for energy (total kWh/m²/yr by fuel and by energy end use), indoor environmental quality (temperature, CO₂, VOC, PM, etc), lighting levels, noise, etc) in line with metrics being developed for the EU Level(s) reporting framework to be used to improve benchmarking and best practice research and which are meaningful to non-technical experts and occupants.
- ACE calls for SRIs to reference a standard for all equipment to be able to communicate seamlessly with one another, with a Building Management System, and remotely to operators, inspectors and maintenance personnel.
- ACE highlights the need for a new standard that in order to streamline the calculations required for reporting a building's overall performance (as per the EU's Level(s) scheme. I.e. on indoor environmental quality, such as CO₂ VOC & particulate content, reporting of lighting levels, decibel levels etc.).
- ACE advocates for interoperability and openness of the SRI to third party systems. ACE suggests that data originating from or received by the maintenance / inspection personnel should also be considered for inclusion.
- This capability and how the measurements are communicated to occupants, energy suppliers and building operators also needs to be defined for installed equipment, with special focus on facilitating easy-to-use interface design.
- ACE asks SRI to consider the relevance and incorporation of the data generated by smart buildings into BIM standards

HOLISTIC APPROACH

1. SRI needs to ensure that the benefits of technical systems are evaluated on the basis of their whole life contribution and environmental impact.

ACE calls for a clear convergence between the SRI and:



- Energy Performance Certificates (EPCs), which currently measure notional performance whereas data from equipment regulated by the SRI relates to measured performance. This highlights the need for a standard that describes the protocol for comparing an asset rating to measured performance in use (see separate point below regarding relation with EPC).
- Level(s), the Commission's new sustainability reporting metrics. For example automated systems that regulate indoor environmental quality in a space should be able to measure and report on CO₂, VOC, particulate matters and other parameters listed under the LEVEL(S) scheme and communicate this according to a universal standard. The equipment installed needs to be able to do the reporting to be in line with the metrics laid out in LEVEL(S),
- the Building Renovation Passport,
- BIM standards and BMS protocols as these are likely to become the key sources of building performance data

2. It is essential that the SRI does not penalise buildings with fabric first approach and where passive measures have been prioritised.

ACE welcomes the fact that the SRI rating is proposed to be based on the availability of smart technologies/measures in a building where there is potential for them. A building with no mechanical cooling and mechanical ventilation should not be assessed for potential smart measures related to these systems and its SRI rating should not be affected. Instead, the focus could be on the potential smart measures applicable to the heating system.

No matter how airtight a building is and how well the building is insulated, a heating system will probably be installed in central and northern Europe. Smart measures such as optimum start/stop for boilers/heat pumps, demand control on heating pumps, demand response management (including load shifting where heat pumps are used for heating) could be assessed and SRI would effectively indicate the ratio of available measures to potential measures based on the actual building context.

ACE recommendations:

- ACE would be keen to see in the SRI an incorporation of BMS requirements that ensure that the demand control and data output features actually work. The poor implementation of controls presents a substantial risk of energy and comfort shortfalls in buildings.
- ACE also calls for the recognition of the load shifting capabilities of architectural features, such as thermal mass, the hygroscopy of the build-up and floor to ceiling heights.
- More resilient, architectural and passive solutions to building performance (building form & configuration, including floor to floor heights, mass, usability, spatial adaptability, etc.) should be prioritised in all cases and especially when the requirements in terms of long-term cost and expertise are not guaranteed to be available.

BUSINESS CASE

1. ACE is highly concerned by the lack of attention to measured data and real performance. The availability of smart measures does not necessarily mean that they are actually working. Studies reveal that highly automated buildings that are not commissioned, operated or maintained to a high standard show a high performance gap



- they can be costly to operate and maintain, can consume significantly more energy than anticipated and can fall short of providing the expected indoor environmental quality.

The tick-box approach (focus on theoretical performance only) that EPCs are so often accused of is repeated here. One may have potentially great smart technologies in a building but it is important to ascertain whether these are working as intended. It is one thing to tick the box and say the technologies are available, quite another thing to confirm they are actually working.

For example, a building can get credit for its sub-metering strategy that on paper provides a detailed picture of the building's energy performance. However, unless the data is checked and reconciled with measured performance, one does not know whether the strategy would be effective in practice. The unintended consequence of such an approach to SRI could be buildings with high/good SRI ratings that are actually performing very poorly, which would in turn discredit the scheme.

It is questionable how a scheme with such credibility issues could help transform the market and increase the rate of building renovation. It is an ACE concern that the SRI would effectively create a 'blank cheque' for the automation industry and turn the notion of 'smart buildings' a ticking time bomb.

Furthermore, ACE regrets that the impact assessment carried out by the consultants only focuses on potential energy savings and load shifting potential and does not cover other aspects of building performance such as comfort, health, well-being. There is no acknowledgment of the risk of the performance gap in their impact assessment; the underlying assumption was that an increase in smart measures will improve energy performance. The figures are currently too optimistic.

ACE recommends:

- SRIs should be accompanied by adequate risk assessment that address the design, specification, construction, commissioning and operating requirements and their cost implications and allow these to be balanced against other means of achieving optimal indoor environmental quality.
- On site exemptions should only be permitted for smart ready buildings if the measured performance of all equipment and end use has been reconciled with 'as designed' parameters of all technical building systems and when these match the data communicated remotely. In all cases smart ready buildings should be required to undergo remote inspections annually.
- It may not be cost effective to do a thorough analysis of the actual operation of SRI measures. However, as a minimum, the assessor should be able to identify the potential risks and come up with recommendations to help user get best out of SRI measures. A performance based recommendation report and emphasis on the certificate or in the report to point out that having SRI measures does not necessarily mean they are operating optimally or as intended would be helpful.

2. Make use of the generated data to provide benchmarks and research that can inform policy makers and industry stakeholders on best practice and long-term returns on investment.

A significant cause of the building performance gap has been shown to be the lack of awareness of best practice in *occupied* buildings, the lack of information available about a



building's intended operating regime. ACE calls for the disclosure of aggregated data collected for statistical and research purposes.

3. ACE recommends that Member States have the option to incorporate SRI in the future updates of their EPCs.

The SRI as it is set out does not present a convincing business proposition. As some of the criteria are already covered during a typical EPC assessment, we fear that many Member States are likely to be wary of duplication, the additional burden of assessment and the need to involve yet another assessor.

ACE understands that EPC is a mandatory requirement, whereas SRI is currently being developed as a voluntary initiative, it recommends a clear convergence between EPCs and the SRI. This could be done at the MS level: Member States could have the option to incorporate SRI level in the next/future updates of their EPCs. This could be reflected on the certificate or reported in the recommendation report as % technological readiness with supportive recommendations as to how this could be improved, with clear guidance on what these features would allow occupants and building managers accomplish.

4. ACE strongly opposes the exemption of technical building systems from inspections when automated.

As already said, evidence shows that automation actually increases the risks of performance shortfalls.

ACE strongly advises against exemptions from inspections and instead recommends inspections could be carried out remotely once the remote and on-site readings have been reconciled by an independent competent person with an appropriate, nationally recognized qualification or accreditation. This would create an incentive to have the automation installed and commissioned so that it CAN be remotely accessed and run. It is crucial to reconcile measured performance, equipment performance and transmitted performance. Only where such tests have been carried out and performance validated should remote inspections be allowed.