Support for setting up a Smart Readiness Indicator for buildings and related impact assessment - Background paper for stakeholder meeting 7 June 2017

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EXECUTIVE SUMMARY

Smart technologies in buildings have the potential to contribute to increasing the energy efficiency of the building stock, to enhancing flexibility in smart energy grids, and to enhancing comfort of building occupants. In order to increase the visibility and uptake of smart technologies in the European building stock, the introduction of a Smart Readiness Indicator (SRI) for buildings is advocated in the proposal for amending the Energy Performance of Buildings Directive (EPBD). This indicator would allow to assess the level of smartness of a given building in a reliable and meaningful way for building owners, tenants and users.

A technical study was launched in March 2017 in order to further investigate the scope, definition and calculation of this SRI, also aiming at a more detailed assessment of its potential impacts. The objective is to provide technical support to the Directorate-General for Energy of the European Commission in order to feed the negotiations and decision process on the potential introduction of the indicator. On top of its technical tasks, the study gives great importance to the involvement of stakeholders, making sure their feedback is collected and taken into account. This background paper is sent out to stakeholders prior to the first stakeholder interacting workshop taking place on 7 June 2017 in Brussels.

This document introduces the scope of the study and outlines its first outcomes. The first task in this study consists in defining a structured mapping of the services that can be delivered by smart (ready) technologies (SRT), covering ten different functional areas (domains). Each of these services can be delivered by a number of technological solutions, with functionalities that can be ranked on a smartness scale. Furthermore, this document outlines the process that will be followed to define a calculation methodology for the proposed SRI. The process to develop a SRI should consider equally the need to reliably capture the smart readiness functions and services and the ease and potential costs of the independent assessment of the SRI. The document also outlines the approach that will be followed to assess in more details the potential impacts of the SRI. More detailed information will be given at the stakeholder meeting and in the technical reports delivered in the subsequent phases of the study.

Throughout the process, stakeholders will be informed about the progress of the study. They will be invited to express their views during a number of meetings and to provide written comments to technical reports uploaded on the project website https://smartreadinessindicator.eu.

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LIST OF ACRONYMS

EC	European Commission
EU	European Union
EPBD	Energy Performance of Buildings Directive
ICT	Information and Communication Technologies
SR	Smart Ready
SRI	Smart Readiness Indicator
SRT	Smart Ready Technologies
RES	Renewable Energy Sources
TBS	Technical Building Systems
BACS	Building Automation and Control Systems

SCOPE AND OBJECTIVES OF THE STUDY

BACKGROUND

At the end of November 2016, the European Commission (EC) presented the "Clean Energy for All Europeans" package of proposals[1] to amend and adapt several key directives in the field of energy efficiency, renewable energy, electricity market design, security of electricity supply and energy governance.

In the scope of this package, buildings are treated as an essential driver of the energy transition. Buildings consume 40% of European Union (EU)'s final energy. Around 75% of the current EU housing stock is considered to be energy inefficient; annual renovation rates are low (0,4-1,2%) and the renovation depth is generally considered too shallow. There is a clear need to accelerate and finance building renovation investments and leverage smart, energy-efficient technologies.

One of the focus points of the proposal for amending the Energy Performance of Buildings Directive (EPBD) is to better tap the potential of Smart Ready Technologies (SRT). A greater uptake of smart technologies (SRT) is expected to lead to significant energy savings in a cost-effective way, meanwhile it improves the comfort in the buildings and has the building adjusted to the needs of the user. Additionally, smart buildings have been identified and acknowledged as the key enablers of the future energy systems, in which there will be larger share of renewables, distributed supply and flexibility which is also managed on the demand side (e-mobility infrastructure, on-site electricity generation, energy storage).[2]

Information and Communication Technologies (ICT) and smart systems are already considered in the current EPBD[3]. The aim of the proposal for amending the Directive is to provide additional support by:

- introducing Building Automation and Control Systems (BACS) as an alternative to physical inspections,
- using building codes to support the roll-out of the recharging infrastructure for e-mobility,
- introducing a 'Smart Readiness Indicator (SRI) for Buildings' (called 'Smartness Indicator' in the proposal) to assess the technological readiness of buildings to interact with their occupants and the energy environment and, to operate more efficiently.

Introducing such a SRI would raise awareness on the benefits of smarter building technologies and functionalities, encouraging investments therein. It could be an incentive for the integration of cutting edge ICT-based solutions for energy efficiency into buildings, which can effectively assist in

[1] http://ec.europa.eu/energy/en/content/energy-efficiency-directive-winter-package-2016 (accessed 31 May)

[2] Impact Assessment accompanying the proposal for amending the Energy Performance of Buildings Directive, SWD(2016) 414

[3] (1) the support to the introduction of intelligent metering systems and active control systems that aim to save energy, in line with Article 8; and (2) the possibility to use electronic monitoring and control systems as a partial replacement to inspections of heating and air conditioning systems, in line with Articles 14 and 15.

creating more healthy and comfortable buildings with a lower energy use and carbon impact, and can facilitate the integration of Renewable Energy Sources (RES).

OBJECTIVES OF THE STUDY

In the proposal for an amended EPBD, the new article 8(6) advocates the definition of a 'Smart Readiness Indicator for Buildings' which should characterize the ability of a building to:

- manage itself,
- interact with its occupants,
- take part in demand response and contribute to smooth, safe and optimal operation of connected energy assets.

This study is intended to provide technical support to the Directorate-General for Energy of the European Commission services in order to feed the current discussions on the definition and provision of this SRI. The study should in particular lead to the definition a robust and harmonised methodology to determine an SRI for European buildings, in line with the characteristics highlighted above. A technical and market analysis will also be carried out to evaluate more precisely the expected impact of the proposed indicator.

SCOPE OF THE STUDY

In recent years, ICT systems in buildings have made significant progress, and they are expected to play a major enabling role in increasing the energy efficiency of the building stock in the future. In the context of the study, the main focus will be on *active* technologies which enhance operation in accordance with users' needs and energy efficiency:

- Readiness to adapt in response to the needs of the occupant (e.g. automated management of heating system based on occupancy monitoring) and to empower building occupants by taking direct control of their energy consumption and/or generation (i.e. prosumer);
- Readiness to facilitate maintenance and efficient operation of the building in a more automated and controlled manner (e.g. signal when systems need maintenance or repair; use of CO_2 sensors to decide when to increase ventilation);
- Readiness to adapt in response to the needs/situation of the grid (e.g. reduce consumption when demand is high).

MAPPING SMART READY SERVICES IN BUILDINGS

A first task of the study consists of mapping a broad range of Smart Ready (SR) services delivered to the building user. These services are enabled by (a combination of) smart ready technologies, but are defined in a technology neutral way, e.g. 'provide temperature control in a room'. Based on desk research including an analysis of standards (e.g. EN 15232[4]), industry roadmaps, existing initiatives and studies, a first catalogue of smart services has been composed along the following domains[5]: Heating, Cooling, Domestic Hot Water, Mechanical Ventilation, Lighting, Dynamic Building Envelope, On-site Renewable Energy Generation, Demand Side Management, Electric Vehicle Charging, and Monitoring and Control.

Each of these domains includes a set of services, and for some of these services a further hierarchical dependence on underlying services is indicated, as illustrated in Figure 1. For each of the services (and sub-services), different functionality levels are defined, ranging from limited basic functionality to fully integrated smart solutions. As an example, the lowest level of smartness of the "*window opening control*" service could be "manual control of motorized windows", while the most advanced level could consist of a centralized optimized coordination of automatically controllable windows in the whole building, taking into account environmental parameters.

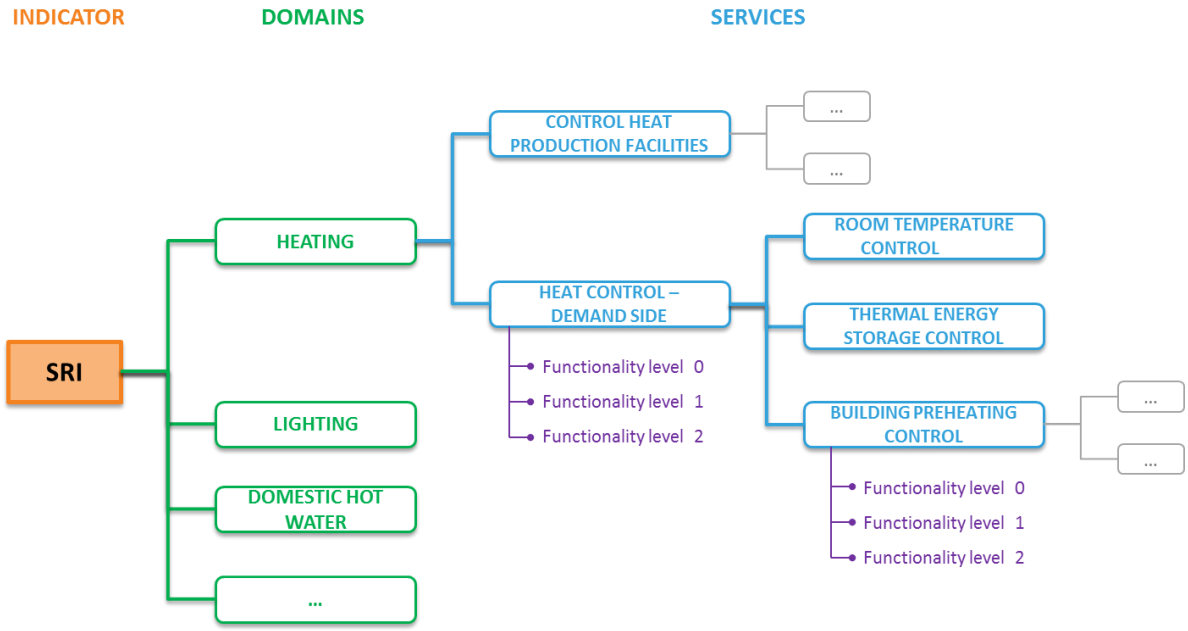

Figure 1 – Extract from the SR services mapping

[4] EN 15232 is the standard 'Energy performance of buildings - Impact of Building Automation, Controls and Building Management'

[5] Occupant comfort and health are currently not treated as domains in the context of this study, but rather as important boundary conditions to the operation of the technical building systems (TBS).

TOWARDS A SMART READINESS INDICATOR

SRI METHODOLOGY

The process to develop a SRI should consider equally the need to reliably capture the smart readiness functions and services and the ease and potential costs of the independent assessment of the SRI. The assessment of the indicator of a given building should be performed in the shortest time possible and with limited costs. The technical feasibility of the assessment (e.g. the extent to which a SR service can be assessed and the technical expertise required to evaluate it) will be a key criterion in the design of the SRI and its calculation methodology. This focus on cost-effectiveness will not prevent exploring more extensive (and complex) approaches to the definition and calculation of the SRI, which could be considered depending on the implementation needs and priorities.

Given the large number of SR services that could potentially be included in the scope of the SRI, and considering the requirements stated above, the aim is to propose a ranking of the SR services. The ranking of a given service will be determined based on the expected impacts (benefits) of the service and on the feasibility of its assessment (in particular in terms of time and costs).

The benefits that would be considered in determining the ranking of SR services are not yet fully defined and the consortium is open to any feedback on this point. The consortium will try to favour when possible quantitative benefits, possibly expressed in monetary terms. But the inherent difficulty of monetising all benefits and costs[6] might lead to a hybrid approach mixing quantitative and qualitative aspects.

In addition to defining and ranking the SR services that should be included in the SRI, a methodology will be developed that allows the derivation of an overall SRI score (or ranking). In this process, the breadth and level of smartness of the services and functions offered will be considered, on top of further considerations such as the interoperability of the smart ready technologies. There are a variety of analytical frameworks that can be used to compile such an indicator[7], which include frameworks to combine quantifiable and qualitative parameters, and also include methods specifically designed to apply to building energy and environmental impact assessment. These methods will be assembled and their suitability analysed for the development of a SRI calculation framework. The calculation of the SRI score (or ranking) will require to define weightings of the considered parameters, which should be derived and applied in a transparent

[6] In principle, benefits (e.g. energy savings) can be monetised by using actual or commonly agreed shadow prices; however, the derivation of a commonly accepted shadow price might be challenging in some cases (for instance for comfort enhancement). Nonetheless, it is important to attempt to create as objective an evaluation framework as possible so that policymakers can distinguish between those aspects of a decision which are more objective and those which are more subjective.

[7] For example, see the assessment of environmental points schemes complied in the Task 2 report of the Technical assistance study for the assessment of the feasibility of using "points system" methods in the implementation of the Ecodesign Directive, https://points-system.eu/ (accessed May, 2017)

and consensual manner. The study team will present various options that will be assessed and refined based on stakeholders' feedback.

Ultimately, the study team understands that their role is to provide evidence and suggestions for structural frameworks and elements that support this policymaking process, but that designated policymakers will make the decisions about what elements should be included within an SRI, what weightings should be applied, the level of effort and costs associated with their assessment, etc. In summary then, the aim of this exercise is to help derive an SRI that is salient to end-users, practical and affordable to implement and that correctly reflects the smart readiness functionality that a building offers in terms of a commonly agreed scale of net benefits.

ASSESSMENT OF IMPACTS

The impact assessment will be a significant focus of the study. It will cover the saving potential for SRT in (primary) energy and CO_2 emissions besides other relevant aspects such as economics, health and life cycle aspects for the time slices 2020, 2030 and 2050. The EU saving potential will be simulated for different scenarios, based on a set of reference buildings. The potential impacts of possible supporting measures and policy actions will also be analysed, with respect to the support to the deployment of SRT and related savings. The calculation of the potential effects will be "calibrated" top down with the experience of evaluation projects like the supporting study for setting up an observatory of the building stock and related key policies[8].

In order to ensure a maximum reliability and coverage, a multi-fold approach will be used for data-collection, covering data from existing studies, publications and from stakeholders. Desk research will be performed to minimise potential gaps and to further validate the data.

[8] ENER/C3/2014-543 'Support for setting up an observatory of the building stock and related key policies', https://ec.europa.eu/energy/en/funding/funding-and-support-programmes/support-setting-observatory-building-stock-and-related-key (accessed May, 2017)

STAKEHOLDER CONSULTATION

Throughout the work, the consortium partners will consult stakeholders. The feedback received will inform the analysis and help building awareness and consensus on the SRI and its calculation methodology.

A number of meetings will be organized to discuss the progress and give invited stakeholders the opportunity to express their views. These meetings are upon invitation, to ensure a balanced representation across all main relevant sectors and interested parties.

Besides these meetings, the project website https://smartreadinessindicator.eu/ is the main information exchange platform between the consortium and the stakeholders. Stakeholders will be invited to provide written comments which will be organised by e-mail and through the website. Feedback will be collected in a structured way, using a specific template and also including the response to the stakeholders' comments from the consortium.