



D 3.1 – Review of the SRI methodology



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Executive Summary

This task aims to realise a detailed overview of the current SRI methodology, in line with the study accomplished under the authority of the European Commission DG Energy and the Delegated Regulations (EU) 2020/2155 and (EU) 2020/2156, aiming to identify the related procedures needed for the issuance of SRI certification (assessment method A, B etc.).

It also aims to develop the required procedures for the realisation of SRI certification in an automated manner, including the customization of the service catalogue and the domain weightings (e.g. heating, cooling, ventilation) depending on the national priorities and the climatic conditions.

Accordingly, the report includes sections that address:

- Legal framework of the SRI
- Summarise the SRI methodology
- Provide detailed descriptions of SRI methodologies B and A (in that order)
- Comparison of Method A and Method B
- The freedoms MS have to adapt the methodology
- Implementation within the easySRI calculation tool
- SRI assessment
- Issuance of certificates, parties involved and registration
- Interactions with other building performance assessment schemes
- The maintenance and evolution of the SRI methodology
- Emerging findings from MS SRI test phases
- The potential for a future operational performance methodology

Section 15 Conclusions and future work

The report provides key inputs to the Task 3.4 work to frame the aspects and functionalities that the easySRI calculation engine and easySRI Wizard tool will need to provide.

From this the following conclusions can already be made about the required capabilities of the easySRI calculation tool:

The easySRI calculation engine should allow:

- All the functionality in the EC's default service catalogues (of which the latest is v4.5)
- The option of being updated to reflect future changes in the service catalogues
- The selection of method A or B
- The ability for MS to choose services they want within the existing domains
- The ability for MS to add services they want within the existing domains
- The ability for MS to add extra functionality levels within existing services
- The ability for MS to change the impact scores per service functionality level should they wish
- The ability for MS specified weightings to be applied for:
 - Climate (e.g. energy balance related)
 - Building type
 - Service relevance (e.g. zeroing out if not relevant as determined through the tirage process or a priori)

The easySRI calculation engine should report (at least) the:

- Overall SRI score
- Which class category the overall SRI score puts the building into (noting the while the numerical class boundaries are set in the delegated regulation the class names associated with these are specified at the Member State level)
- SRI scores for the 3 pillars (three key functionalities) in line with the weighting of impacts to pillars specified in the delegated regulation
- SRI scores aggregated for each impact criterion
- The matrix of SRI scores for each domain and impact criteria

In addition:

- It should also allow all user (MS) adaptations to be clearly transparent - ideally it would produce both the MS adapted results but also the results aligned to the EC's default Methods A or B
- It should also allow normalised weighting by functionality across the building (not just the 2 levels permitted in the EC's default service catalogue v4.5) but any combination of levels making 100% for the given service)

Optionally, but preferably, it should allow:

- Linkage with energy balance data from EPCs (as an option, specified by the MS, to allow the energy balance weightings to be taken from the actual EPC data rather than the default climatic derived energy balance data – note MS would need to clearly specify the circumstances of when this should be done, and the easySRI should support the option of reporting the SRI scores both when calculated with the EPC energy balance data and with the default energy balance data)
- Whenever sufficient BACS functionality level data is available (see sections 4 and 5 for how/when the SRI functionality levels are aligned with the EN15232 BACS functionality levels) for the derivation of the building's BACS factor calcs per EN15232 or the ISO/EN update to it – the resulting BACS factor calculation results should be capable of being ported back into EPC software to allow an update of the EPC primary energy values based on the BACS factor corrections, this would (finally!) allow the contribution of BACS to be reflected in the EPC which is clear and glaring deficiency in current EPC energy performance calculations and a major additional value of the SRI (which mostly aligns to the EN15232 BACS functionality factors) – this option could either be directly incorporated into the easySRI calculation engine or added as a future extension; however, bringing it in now, should be quite straightforward to implement, and greatly increase the value added of an SRI assessment (by bringing control functionality into the EPC, which is currently missing yet makes a big difference to building energy performance – as a corollary to this, as many MS are expected to be implementing measures to require poorly EPC classed buildings to be upgraded to a higher class, the implementation of higher BACS functionality is one of the least invasive, cheapest and most readily implementable means of doing so that is recognized in the EPB calculation standards - so this is a major prospective value added for both the SRI, the EPCs (if recognized and integrated) and hence the easySRI calculation tool)
- Linkage with EPC calculation and reporting software, noting that the potential for standardized SRI assessment reports to be uploaded and linked with specific EPC data fields through automatic checks holds promise for enhancing the coexistence of these assessments
- Linkage with building logbook/BIM data and software
- Linkage with building Renovation Passports

Much information has also already been presented about the assessment and certification process and this also has significant implications for the functionalities and design of the easySRI wizard tool. Tasks 3.2 on Linkage of energy efficiency with the SRI, 3.3 on the Technical and Financial indicators for SRTs are also very pertinent for the functionalities and procedures needed for the wizard tool, so the intent is to bring all of the assembled information together into a coherent description of functionalities related to all these issues in the Task 3.4 report on easySRI implementation pathways for EU Member States. Nonetheless, it can already be stated that as a priori the wizard tool should support the assessment process, it should also provide guidance to assessors (whether those charged with doing formal certification or simply those doing self assessment). Also the wizard tool will need to support examination and explanation of SRI results to users of the SRI in addition to other functionalities to be examined in Task 3.4. With regard to support of the certification process the wizard tool should be designed with the recommendations expressed in section 10 taken in mind.

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List of Acronyms and Abbreviations

Term	Description
BAC	<p>Building automation and control. Products, software, and engineering services for automatic controls, monitoring and optimisation, human intervention, and management to achieve energy-efficient, economical, and safe operation of building services equipment.</p> <p>“Control” does not imply that the system or device is restricted to input/output, processing, optimisation, management, and operator functions. Processing of data and information is possible.</p> <p>Mainly field and control devices, switchgear assembly, cabling, communication and computing devices, system software and functions achieved by engineering services.</p>
BACS	<p>Building automation and control system. System, comprising all BACs.</p> <p>BACS is also referred as BMS (building management system)</p> <p>BEMS (building energy management system) is part of a BMS.</p>
BEMS	<p>Building energy management system. Comprises data collection, logging, alarming, reporting, and analysis of energy usage, etc. The system is designed to reduce the energy consumption, improve the utilisation, increase reliability, and predict performance of the technical building systems, as well as optimise energy usage and reducing its cost.</p>
BMS	<p>Building management systems. Totality of services involved in the management operation and monitoring of buildings (including plants and installations).</p> <p>Building management can be assigned as part of facility management.</p>
Building fabric	<p>Building fabric. All physical elements of a building, excluding technical building systems.</p> <p>It is often described as the building as such.</p> <p>It includes elements both inside and outside of the thermal envelope, including the thermal envelope itself.</p>
Building service	<p>Building service. Service provided by technical building systems and by appliances to provide acceptable indoor environment conditions, domestic hot water, illumination levels and other services related to the use of the building.</p> <p>The services included in EPB assessments are referred to as “EPB services”. Contrarily those not included as “non-EPB services”.</p>
Distant	<p>Distant. Not on-site nor nearby.</p>
EPC	<p>Energy Performance Certificate</p>
Functionality level	<p>Functionality level, as a term within the SRI calculation methodology, means the level of smart readiness of a smart-ready service.</p>
Nearby	<p>Nearby. On local or district level.</p>
On-site	<p>On-site. Premises and the parcel of land on which the building(s) is located and the building itself.</p> <p>On-site is defining a strong link between the energy source (localisation and interaction) and the building.</p>

SRI	Smart readiness indicator
SRT	Smart ready technology
TABS	Thermally activated building system. Massive building fabric actively heated or cooled by integrated air- or water-based systems.
TBM	Technical building management. Processes and services related to operation and management of building and technical building system through the interrelationships between the different disciplines and trades.
TBS	<p>Technical building systems. Technical equipment for heating, cooling, ventilation, humidification, dehumidification, domestic hot water, lighting, and electricity production.</p> <p>A technical building system is composed of different subsystems.</p>
Technical domain	Technical domain , as a term within the SRI calculation methodology, means a collection of smart-ready services which, together, realise an integrated and consistent part of the services expected from the building or building unit.
Thermal envelope area	<p>Thermal envelope area. Total area of all elements of a building that enclose thermally conditioned spaces through which thermal energy is transferred, directly or indirectly, to or from the external environment.</p> <p>The thermal envelope area depends on whether internal, overall internal, or external dimensions are being used.</p>
Smart-ready service	<p>Smart-ready service, as a term within the SRI calculation methodology, means a function or an aggregation of functions provided by one or more technical components or systems.</p> <p>A smart-ready service makes use of smart-ready technologies and orchestrates them into higher-level functions.</p>
Smart-ready technology	Smart-ready technology (see SRT) , as a term within the SRI calculation methodology, means a technological enabler for one or more smart-ready services.

1 Introduction

1.1 Scope and objectives of the deliverable

The aim of Task 3.1 is to provide a detailed overview of the current SRI methodology, in line with the study accomplished under the authority of the European Commission DG Energy and the Delegated Regulations (EU) 2020/2155 and (EU) 2020/2156, aiming to identify the related procedures needed for the issuance of SRI certification (assessment method A, B, “C” etc.). The end result is the development of the required procedures for the realisation of SRI certification in an automated manner, including the customization of the service catalogue and the domain weightings (e.g. heating, cooling, ventilation) depending on the national priorities and the climatic conditions.

1.2 Relation to other tasks and deliverables

This task is linked to WP2, Task 2.2, regarding the architectural design of the SRI platform for the automatic issuance of certificates. The already mentioned platform will have to contain the design model of the certificate that has to be issued, depending on the entry parameters corresponding to the data collection in buildings.

The format or model of the certificate that is to be issued will have to contain the information decided in Task 3.1, depending on the use and type of the building.

1.3 Structure of the deliverable

In order to achieve the objectives set out in section 1.1 the Task has been structured to deliver the following findings:

- Section 1 Introduction
- Section 2 Legal framework of the SRI
- Section 3 Summary of the SRI methodology
- Section 4 Detailed description of SRI methodology B
- Section 5 Detailed description of SRI methodology A
- Section 6 Comparison of Method A and Method B
- Section 7 Freedoms MS have to adapt the methodology
- Section 8 Implementation within the easySRI calculation tool
- Section 9 Assessment
- Section 10 Issuance of certificates, parties involved and registration
- Section 11 Interaction with other building performance assessment schemes
- Section 12 Maintenance of the SRI methodology
- Section 13 Emerging findings from MS test phases
- Section 14 Potential for a future operational performance methodology
- Section 15 Conclusions and future work

Accordingly, after the SRI’s legal framework has been set out in Section 2 the following five sections concern aspects related to the SRI’s calculation methodology both in terms of the current extant methodologies A and B but also those that Member States may choose to implement while respecting the provisions under the

delegated regulation. These sections are designed to inform the design of the easySRI calculation tool. To this end it should be noted that the descriptions of the Methodologies B and A are extremely detailed and comprehensive to ensure that every aspect is captured in the easySRI calculation tool, however, much of this material can be skipped by readers who are less concerned with development of the tool.

Sections 9 to 11 are concerned with the SRI assessment process and related certification issues and hence are of most relevance to inform the design of the easySRI wizard tool. A priori the wizard tool will support SRI assessment conducted in line with any predetermined methodology that respects the requirements in the delegated and implementing regulations. It will also act as the user interface to display the results to both assessors and end-users.

The remaining four sections address miscellaneous issues that the easySRI development team need to be fully cognisant of when conducted the work in work package 4.

The conduct of the work reported in this deliverable was organised into the subtasks described in the figure below and implemented (mostly) in line with this schedule by the actors mentioned.

	WSEE 5PM	SERA 2PM	CERTH 2PM	FREDU 2PM	CRES 1PM	DEMO 1PM	CETMA 1PM	SGS 1PM	Feb-23 M4	March M5	April M6	May M7	June M8	July M9	August M10	Sept. M11	Oct. M12	Nov. M13	Dec. M14
a	Describe in depth the methodology as developed under the SRI support contract	X																	
b	Describe in detail the service catalogue	X																	
c	Describe the legal requirements with regard to the methodology	X																	
d	Discuss the freedom MS have to adapt the methodology – produce concrete examples	x	x			X													
e	Describe activities/procedures etc. to maintain the "common" methodology in detail	X																	
f	Identify and describe in detail all actual and potential procedures for the issuance of SRI certificates	x	x				x	X											
g	Identify and describe in depth the various functionalities that automated certification procedures would require (including the customization of the service catalogue and the domain weightings etc.)	x		x	X			x											
h	Relate the above to use-cases to frame this for WP4	x		X	x														
i	Report writing	X		x	x	x		x											
Key: X = activity lead, x = contributor																			

Figure 1. Structure and schedule of the Task

2 Legal framework of the SRI

The SRI's legal framework is set out under the auspices of the Energy Performance in Buildings Directive¹ and via specific implementing and delegated regulations issued under the Directive.

Within the amended EPBD (2018/844) the following text was introduced with regard to the SRI within an amended Article 8 and a new Annex 1a:

Article 8

Technical building systems, electromobility and smart readiness indicator

10. The Commission shall, by 31 December 2019, adopt a delegated act in accordance with Article 23, supplementing this Directive by establishing an optional common Union scheme for rating the smart readiness of buildings. The rating shall be based on an assessment of the capabilities of a building or building unit to adapt its operation to the needs of the occupant and the grid and to improve its energy efficiency and overall performance.

In accordance with Annex Ia, the optional common Union scheme for rating the smart readiness of buildings shall:

- (a) establish the definition of the smart readiness indicator; and
- (b) establish a methodology by which it is to be calculated.

11. The Commission shall, by 31 December 2019, and after having consulted the relevant stakeholders, adopt an implementing act detailing the technical modalities for the effective implementation of the scheme referred to in paragraph 10 of this Article, including a timeline for a non-committal test-phase at national level, and clarifying the complementary relation of the scheme to the energy performance certificates referred to in Article 11.

That implementing act shall be adopted in accordance with the examination procedure referred to in Article 26(3).

(*3) Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (OJ L 307, 28.10.2014, p. 1)."

(*4) Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (OJ L 124, 20.5.2003, p. 36).".

The following Annex is inserted:

‘ANNEX IA

COMMON GENERAL FRAMEWORK FOR RATING THE SMART READINESS OF BUILDINGS

1. The Commission shall establish the definition of the smart readiness indicator and a methodology by which it

¹ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency (Text with EEA relevance) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.156.01.0075.01.ENG

is to be calculated, in order to assess the capabilities of a building or building unit to adapt its operation to the needs of the occupant and of the grid and to improve its energy efficiency and overall performance.

The smart readiness indicator shall cover features for enhanced energy savings, benchmarking and flexibility, enhanced functionalities and capabilities resulting from more interconnected and intelligent devices.

The methodology shall take into account features such as smart meters, building automation and control systems, self-regulating devices for the regulation of indoor air temperature, built-in home appliances, recharging points for electric vehicles, energy storage and detailed functionalities and the interoperability of those features, as well as benefits for the indoor climate condition, energy efficiency, performance levels and enabled flexibility.

2.The methodology shall rely on three key functionalities relating to the building and its technical building systems:

- (a) the ability to maintain energy performance and operation of the building through the adaptation of energy consumption for example through use of energy from renewable sources;
- (b) the ability to adapt its operation mode in response to the needs of the occupant while paying due attention to the availability of user-friendliness, maintaining healthy indoor climate conditions and the ability to report on energy use; and
- (c) the flexibility of a building's overall electricity demand, including its ability to enable participation in active and passive as well as implicit and explicit demand response, in relation to the grid, for example through flexibility and load shifting capacities.

3.The methodology may further take into account:

- (a) the interoperability between systems (smart meters, building automation and control systems, built-in home appliances, self-regulating devices for the regulation of indoor air temperature within the building and indoor air quality sensors and ventilations); and
- (b) the positive influence of existing communication networks, in particular the existence of high-speed-ready in-building physical infrastructure, such as the voluntary 'broadband ready' label, and the existence of an access point for multi-dwelling buildings, in accordance with Article 8 of Directive 2014/61/EU of the European Parliament and of the Council ^(*).

4.The methodology shall not negatively affect existing national energy performance certification schemes and shall build on related initiatives at national level, while taking into account the principle of occupant ownership, data protection, privacy and security, in compliance with relevant Union data protection and privacy law as well as best available techniques for cyber security.

5.The methodology shall set out the most appropriate format of the smart readiness indicator parameter and shall be simple, transparent, and easily understandable for consumers, owners, investors and demand-response market participants.

(3)Annex II is amended as follows:

- (a) in point 1, the first paragraph is replaced by the following:

‘The competent authorities or bodies to which the competent authorities have delegated the responsibility

for implementing the independent control system shall make a random selection of all the energy performance certificates issued annually and subject them to verification. The sample shall be of a sufficient size to ensure statistically significant compliance results.’;

(b) the following point is added:

‘3.Where information is added to a database it shall be possible for national authorities to identify the originator of the addition, for monitoring and verification purposes.’.

(^{*1}) Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks ([OJ L 155, 23.5.2014, p. 1](#)).’;

Subsequent to this:

- the Delegated Regulation (EU) 2020/2155² was issued which establishes the definition of the SRI and a common methodology by which it is to be calculated (in the annex³),
- the Implementing Regulation (EU) 2020/2156⁴ and its annex⁵ was issued

Within the Annexes of the Delegated regulation:

- Annex I concerns the calculation of the SRI
- Annex II concerns the Smart readiness impact criteria
- Annex III concerns the Weighting of impact criteria in key functionalities
- Annex IV concerns the Technical domains
- Annex V concerns the Weighting of technical domains
- Annex VI concerns the Smart readiness service catalogue
- Annex VII concerns the Possible adaptation of the standard calculation process
- Annex VIII concerns the Smart readiness rating
- Annex IX concerns the Content of the smart readiness indicator certificate

While the Annex of the Implementing regulation concerns:

- Monitoring of the implementation of the smart readiness indicator scheme

Taken as a whole these legal texts set out what the SRI is (its definition) and the modus operandi for its implementation. There are several critical aspects which are summarised as follows:

- The SRI is an optional scheme which Member States may choose to implement within their jurisdictions but which is a common scheme across the EU
- The SRI definition is set out in the delegated regulation

² COMMISSION DELEGATED REGULATION (EU) 2020/2155 of 14 October 2020 supplementing Directive (EU) 2010/31/EU of the European Parliament and of the Council by establishing an optional common European Union scheme for rating the smart readiness of buildings <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R2155>

³ Annexes to COMMISSION DELEGATED REGULATION (EU) 2020/2155 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2020.431.01.0009.01.ENG&toc=OJ:L:2020:431:TOC#d1e39-14-1

⁴ Commission Implementing Regulation (EU) 2020/2156 of 14 October 2020 detailing the technical modalities for the effective implementation of an optional common Union scheme for rating the smart readiness of buildings (Text with EEA relevance)

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2020.431.01.0025.01.ENG&toc=OJ:L:2020:431:TOC

⁵ ANNEX to Commission Implementing Regulation (EU) 2020/2156 Monitoring of the implementation of the smart readiness indicator scheme https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2020.431.01.0025.01.ENG&toc=OJ:L:2020:431:TOC#d1e32-29-1

- Member States may undertake a non-committal test phase of the smart readiness indicator scheme at national level
- All arrangements of the national test phases shall be defined by Member States. They include but are not limited to the duration, phasing, types of building and geographical zones targeted, aspects of the smart readiness indicator framework that are tested, arrangements for collecting feedback, the criteria for the choice of experts carrying out the smart readiness indicator assessments, the decision on whether an independent control system is established as part of the test phase, the decision on whether certificates are issued and made available to economic operators during the test phase, and designation of a third party to manage the test phase
- The Commission shall make available by 1 April 2021 on its website⁶ a framework that allows building owners, users and other interested stakeholders to evaluate the smart readiness of a building or building unit. Member States may adapt or supplement this framework for use in their national context.
- Where the smart readiness of a building or building unit is evaluated by building owners, users or other stakeholders without the intervention of an expert, this may not lead to the issue of a smart readiness indicator certificate.

If a Member State decides to implement the SRI in their jurisdiction then the following aspects will apply (by topic):

Accreditation and qualification of smart readiness indicator experts

1. Where Member States decide to implement the smart readiness indicator scheme, they may decide that experts accredited or qualified for issuing energy performance certificates, or for carrying out inspection of heating, air-conditioning, combined heating or air-conditioning and ventilation systems under Directive 2010/31/EU, or for performing energy audits under Directive 2012/27/EU, are also competent for issuing smart readiness indicator certificates. In that case, Member States may decide to set additional requirements for those experts in order to qualify for issuing smart readiness indicator certificates, in particular in relation to their training.
2. Member States shall make available to the public information on the qualifications of experts in charge of the smart readiness assessment.
3. Where relevant, Member States may make available to the public either regularly updated lists of qualified or accredited experts or regularly updated lists of accredited companies that offer the services of such experts. Member States may use for this purpose the same means as for experts for energy performance certification and inspections under Article 17 of Directive 2010/31/EU.

Issue of the smart readiness indicator certificate and terms and conditions of its use

1. Any economic operator may request from the experts referred to in Article 3 a smart readiness indicator assessment and certificate for the building or building unit in question.
2. The expert shall verify the reliability of the information collected for the assessment of the smart readiness of the building or building unit and for the issue of the smart readiness indicator certificate.
3. Where relevant, the expert may, when assessing the smart readiness of a building or building unit, take into account other regional or national indicators, and related assessment methods.

⁶ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/sri-implementation-tools_en and specifically: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>

4. A smart readiness indicator certificate shall only be issued on the basis of an assessment performed by a qualified or accredited expert
5. The smart readiness indicator certificate shall include the elements listed in Annex IX to Delegated Regulation (EU) 2020/2155.
6. The validity of the smart readiness indicator certificate shall not exceed 10 years. However, where there is a significant change in a building or building unit that would have had an impact on the initial assessment of smart readiness, a new certificate shall be recommended.

Coupling with energy performance certification and inspection schemes

1. Member States that decides to implement the smart readiness indicator scheme may couple the issuing of the smart readiness indicator certificate with their energy performance certification scheme or with their scheme for the inspection of heating, air-conditioning and combined heating or air-conditioning and ventilation systems under Directive 2010/31/EU, or with their scheme for energy audits under Directive 2012/27/EU.
2. Member States may decide that coupling with those schemes shall be mandatory, in which case a smart readiness indicator certificate shall be issued whenever an energy performance certificate has to be issued or whenever an inspection or audit has to be performed, or that it shall be voluntary, in which case a smart readiness indicator certificate shall be issued only at the request of the economic operator.
3. Where Member States choose to couple the smart readiness indicator scheme with their energy performance certification or inspection or energy audit scheme, they may rely on the independent control system already in place for that scheme.

Monitoring and promotion of the smart readiness indicator scheme

1. Where Member States decide to implement the smart readiness indicator scheme, experts that operate in the respective Member State's or Member States' territory shall report data on the smart readiness indicator certificates they issue to the national or, where applicable, the regional authorities of the respective Member States, in accordance with the Annex to this Regulation.
2. Member States that decide to implement the smart readiness indicator scheme shall report annually to the Commission the number of smart readiness indicator certificates issued on their territory and related statistics, as set out in the Annex to this Regulation.
3. The Commission, based on consultation with Member States, experts and stakeholders, and based on the data provided by experts, shall monitor the market uptake of the smart readiness indicator scheme.
4. Member States that decide to implement the smart readiness indicator scheme may establish additional measures to support the uptake of the scheme. Such measures may be established and reported in the context of the long-term renovation strategies required under Article 2a of Directive 2010/31/EU.

Testing of the smart readiness indicator scheme

1. Member States may undertake a non-committal test phase of the smart readiness indicator scheme at national level.

2. National test phases may begin as from the entry into force of this Regulation.
3. Member States that undertake a national test phase shall submit a report on the related feedback to the Commission up to 6 months after the conclusion of the test phase.
4. All arrangements of the national test phases shall be defined by Member States. They include but are not limited to the duration, phasing, types of building and geographical zones targeted, aspects of the smart readiness indicator framework that are tested, arrangements for collecting feedback, the criteria for the choice of experts carrying out the smart readiness indicator assessments, the decision on whether an independent control system is established as part of the test phase, the decision on whether certificates are issued and made available to economic operators during the test phase, and designation of a third party to manage the test phase, where relevant.
5. At the end of the national test phases, Member States shall assess the outcomes and decide whether they will implement the smart readiness indicator scheme.
6. Member States that plan to undertake a national test phase shall notify the Commission ahead of launching the test phase, also indicating applicable arrangements.
7. The Commission shall support Member States that undertake a test phase of the smart readiness indicator at national level by supplying the framework referred to in Article 6 of this Regulation and by supporting exchanges of information and good practices.
8. The Commission, in consultation with Member States, shall monitor the test phases of the smart readiness indicator scheme.
9. Member States that choose to conduct the test phase may include in their report to the Commission an analysis or evaluation of the data collected by their national experts. Such national analyses or evaluations shall be taken into consideration by the Commission for the purpose of further developing the smart readiness indicator and related methodology.

The Commission Delegated Regulation (EU) 2020/2155⁷ established the definition of the SRI and a common methodology by which it is to be calculated. Its first six annexes⁸ provide information about: the calculation of smart readiness scores (Annex I), the smart readiness impact criteria (Annex II), the weighting of impact criteria in key functionalities (Annex III), the technical domains (Annex IV), the weighting of technical domains (Annex V), and the smart readiness rating (Annex VI).

2.1 Proposed update to the EPBD

The EPBD has been undergoing a review and revision process. At the time of writing the Council and Parliament have published an agreed text⁹, however; this is not yet formally adopted and is awaiting the formal adoption vote. Therefore, its status (including any amendments) will be monitored and reflected in future updates of this report. The current text, in relation to the SRI and related provisions, is set out below:

⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R2155>

⁸ https://energy.ec.europa.eu/document/download/e6b4c362-fddc-43cf-93d2-05244479c60d_en?filename=smart_readiness_buildings_delegated_act_annex_c2020_6930.pdf

⁹ 2021/0426 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast)

<https://data.consilium.europa.eu/doc/document/ST-16655-2023-INIT/en/pdf>

2.1.1 Preamble

The preamble summarises the main articles. That concerning the SRI is as follows:

Article 13, on smart readiness indicator (SRI), tasks the Commission to submit a report on the testing phase of the SRI. Taking into account the outcome of the report, the Commission shall adopt a delegated act requiring the application of the SRI in large non-residential buildings.

Other articles that have relevance to the SRI or its implementation are as follows:

Article 9 (1), on minimum energy performance standards for the non-residential sector, sets rules which will lead to renovating the 16% worst-performing buildings by 2030 and the 26% worst-performing buildings by 2033. Member States will be able to choose whether to express the thresholds in either primary or final energy use. Member States may also exempt individual buildings, in specific cases, while ensuring that the criteria for such exemptions are clear, precise, and stringent. If applying such exemptions, Member States are expected to achieve equivalent energy performance improvements in other parts of the non-residential building stock. Furthermore, in case of natural disaster, Member States may temporarily adjust the maximum energy performance threshold to be able to prioritize the energy renovation of damaged buildings.

Article 9 (2), on the trajectories for progressive renovation of the residential sector, requires Member States to establish a national trajectory that leads to reducing the average primary energy use of the residential building stock by 16% by 2030 and by a range of 20-22% by 2035. 55 % of the decrease of the average primary energy use will need to be achieved through the renovation of worst-performing residential buildings

Article 11, on technical building systems, incorporates the requirements for building automation and control systems (BACS), which were part of article 20 in the Commission proposal. Several provisions were included in this article, in particular regarding fossil-fuel boilers, indoor environmental quality and lighting control.

Article 12, on infrastructure for sustainable mobility, sets different requirements for new and existing non-residential buildings, as well as for new residential buildings. New residential buildings will have to have at least one recharging point. In existing non-residential buildings, a choice between installing one recharging point every ten parking spaces or ducting for at least 50% of the spaces will be possible. 12.

2.1.2 SRI article and annex

The explicit article concerning the SRI and its related annex are as follows:

Article 13 Smart readiness of buildings

1. The Commission shall adopt delegated acts in accordance with Article 29 concerning an optional common Union scheme for rating the smart readiness of buildings. The rating shall be based on an assessment of the capabilities of a building or building unit to adapt its operation to the needs of the occupant, in particular concerning indoor environmental quality and the grid and to improve its energy efficiency and overall performance. In accordance with Annex IV, the optional common Union scheme for rating the smart readiness of buildings shall lay down :

(a) the definition of the smart readiness indicator;

(b) a methodology by which it is to be calculated.

2. The Commission shall, by 31 June 2026, submit a report to the European Parliament and the Council on the testing and implementation of the smart readiness indicator, based on the available results of the national test phases and other relevant projects. Taking into account of the outcome of the report, the Commission shall, by 30 June 2027, adopt a delegated act in accordance with Article 29, supplementing this Directive by requiring the application of the common Union scheme for rating the smart readiness of buildings, in accordance with Annex IV, to non-residential buildings with an effective rated output for heating systems, air-conditioning systems or systems for combined space heating, air-conditioning and ventilation of over 290 kW.

Annex IV COMMON GENERAL FRAMEWORK FOR RATING THE SMART READINESS OF BUILDINGS

1. The Commission shall establish the definition of the smart readiness indicator and a methodology by which it is to be calculated, in order to assess the capabilities of a building or building unit to adapt its operation to the needs of the occupant and of the grid and to improve its energy efficiency and overall performance. The smart readiness indicator shall cover features for enhanced energy savings, benchmarking and flexibility, enhanced functionalities and capabilities resulting from more interconnected and intelligent devices. The methodology shall take into account features such as the possible existence of a digital twin of the building. The methodology shall take into account features such as smart meters, building automation and control systems, self-regulating devices for the regulation of indoor air temperature, built-in home appliances, recharging points for electric vehicles, energy storage and detailed functionalities and the interoperability of those features, as well as benefits for the indoor climate condition, energy efficiency, performance levels and enabled flexibility.
2. The methodology shall rely on the following key functionalities relating to the building and its technical building systems: (a) the ability to maintain energy performance and operation of the building through the adaptation of energy consumption for example through use of energy from renewable sources; (b) the ability to adapt its operation mode in response to the needs of the occupant while paying due attention to the availability of user-friendliness, maintaining healthy indoor climate conditions and the ability to report on energy use; and (c) the flexibility of a building's overall energy demand, including its ability to enable participation in active and passive as well as implicit and explicit demand response, and through storing and releasing energy back to the grid, for example through flexibility and load shifting capacities and energy storage; (ca) the ability to improve its energy efficiency and overall performance through the use of energy saving technologies.
3. The methodology may further take into account: (a) the interoperability between systems (smart meters, building automation and control systems, built-in home appliances, self-regulating devices for the regulation of indoor air temperature within the building and indoor air quality sensors and ventilations); and (b) the positive influence of existing communication networks, in particular the existence of high-speed-ready in-building physical infrastructure, such as the voluntary 'broadband ready' label, and the existence of an access point for multi-dwelling buildings, in accordance with Article 8 of Directive 2014/61/EU of the European Parliament and of the Council.
4. The methodology shall not negatively affect existing national energy performance certification schemes and shall build on related initiatives at national level, while taking into account the principle of occupant ownership, data protection, privacy and security, in compliance with relevant Union data protection and privacy law as well as best available techniques for cyber security.
5. The methodology shall set out the most appropriate format of the smart readiness indicator parameter and shall be simple, transparent, and easily understandable for consumers, owners, investors and demand-response market participants.

3 Summary of the SRI methodology

This section provides a summary of the SRI methodology as stipulated legally in the SRI's delegated regulation but also as implemented in the European Commission's SRI assessment package. It is important to note, that while the Commission's assessment package is fully in accordance with the legal stipulations that this package is an EU-wide common manifestation of what is permitted under the legal stipulations and that the latter allow a wider set of methodological characteristics for the SRI should MS wish to further tailor the SRI methodology. The precise legal methodological requirements are set out in section 3.1 while the specific implementation of these offered in the Commission's SRI assessment package is described in-depth in sections 4 and 5.

3.1 Overview of the SRI assessment methodology

Commission Delegated Regulation (EU) 2020/2155¹⁰ establishes the definition of the SRI and a common methodology by which it is to be calculated. Within this, the first six annexes¹¹ provide information about: the

¹⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R2155>

calculation of smart readiness scores (Annex I), the smart readiness impact criteria (Annex II), the weighting of impact criteria in key functionalities (Annex III), the technical domains (Annex IV), the weighting of technical domains (Annex V), and the smart readiness rating (Annex VI).

Specifically, Article 4 of Commission Delegated Regulation (EU) 2020/2155 specifies:

- *1 The methodology for calculating the smart readiness indicator shall be based on the assessment of smart-ready services present or planned at design stage in a building or building unit, and of smart-ready services that are considered relevant for that building or building unit.*
- *2 The calculation of the smart readiness scores shall be based on a common Union methodological framework set out in Annexes I to VI.*
- *3 The standard calculation methodology set out in Annexes I to VI may be adapted in accordance with Annex VII, in particular by making a link to energy performance calculations in the scope of energy performance certification.*
- *4 The methodology for calculating the smart readiness indicator shall be used in accordance with the conditions set out in this Regulation, in particular regarding the qualification of experts.*
- *The smart readiness rating of a building or building unit shall be based on the smart readiness scores calculated for the building or building unit in accordance with Annex VIII.*

Annex I on Calculation of smart readiness scores stipulates that:

- 1. The smart readiness of a building or building unit reflects the capabilities of the building or building unit to adapt its operation to the needs of the occupants and the grid, and to improve its energy efficiency and overall in-use performance.*
- 2. The smart readiness of a building or building unit is determined on the basis of the assessment of smart-ready services present or planned in, or relevant for, the building or building unit, and their functionality level.*
- 3. The smart readiness of a building or building unit is expressed by a rating that derives from a total smart readiness score expressed as a percentage and that represents the ratio between the smart readiness of the building or building unit compared to the maximum smart readiness that it could reach.*
- 4. The calculation of the smart readiness scores is based on pre-defined weighting factors in line with Annexes III, V and VII, the value of which may depend on climatic conditions and other relevant aspects, such as the type of building.*
- 5. For expressing the smart readiness of a building or building unit, the methodology also allows the use of disaggregated smart readiness scores expressed as a percentage. The disaggregated scores may express smart readiness for one or more of the following:*
 - (a) three key smart readiness functionalities as highlighted in point 2 of Annex Ia, to Directive 2010/31/EU:*
 - (1) energy performance and operation;*
 - (2) response to the needs of the occupants; and*
 - (3) energy flexibility, including the ability of the building or building unit to enable participation in demand response.*
 - (b) the smart readiness impact criteria as defined in Annex II to this Regulation;*
 - (c) the smart readiness technical domains as defined in Annex IV to this Regulation.*
- 6. The calculation of the smart readiness scores of a building or building unit relies on the assessment of the smart-ready services that are present, or planned at design stage, and on their functionality level. The assessment aims to determine with sufficient reliability what services are present or planned, and if so, the*

¹¹ https://energy.ec.europa.eu/document/download/e6b4c362-fddc-43cf-93d2-05244479c60d_en?filename=smart_readiness_buildings_delegated_act_annex_c2020_6930.pdf

functionality level for each of those services. For this purpose, where they are available, digital models of buildings, including building information models or digital twins, may be used. The smart-ready services that can be present in a building are listed in a pre-defined smart-ready service catalogue as set out in Annex VI and are organised in pre-defined technical domains as set out in Annex IV.

7. The calculation of smart readiness scores is made in accordance with the following protocol:

(a) in accordance with the catalogue of smart-ready services as set out in Annex VI to this Regulation, for each technical domain as set out in Annex IV to this Regulation, smart-ready services that are present are assessed and, for each one, the functionality level is determined according to the catalogue of smart-ready services.

(b) in accordance with the catalogue of smart-ready services, and for each smart readiness impact criterion as set out in Annex II, the score $I(d, ic)$ of each technical domain is determined, as follows:

$$I(d, ic) = \sum_{i=1}^{N_d} I_{ic}(FL(S_{i,d}))$$

where:

(1) d is the number of the technical domain in question,

(2) ic is the number of the impact criterion in question,

(3) N_d is the total number of services in technical domain d ,

(4) $S_{i,d}$ is service i of technical domain d ,

(5) $FL(S_{i,d})$ is the functionality level of service $S_{i,d}$ as available in the building or building unit,

(6) $I_{ic}(FL(S_{i,d}))$ is the score of service $S_{i,d}$ for impact criterion number ic , according to the service's functionality level,

(c) in accordance with the catalogue of smart-ready services, the maximum score of each technical domain for each impact criterion $I_{max}(d, ic)$ is determined, as follows:

$$I_{max}(d, ic) = \sum_{i=1}^{N_d} I_{ic}(F_{max}(S_{i,d}))$$

where:

(1) $FL_{max}(S_{i,d})$ is the highest functionality level that service $S_{i,d}$ could have according to the smart-ready service catalogue,

(2) $I_{ic}(FL_{max}(S_{i,d}))$ is the score of service $S_{i,d}$ for its highest functionality level, which means the maximum score of service $S_{i,d}$ for impact criterion number ic ,

(d) The smart readiness score expressed as a percentage for each of the impact criterion SR_{ic} is determined using the weighting specified in Annex V, as follows:

$$SR_{ic} = \frac{\sum_{d=1}^N W_{d,ic} \times (I(d, ic))}{\sum_{d=1}^N W_{d,ic} \times (I_{max}(d, ic))} \times 100$$

where:

(1) d is the number of the technical domain in question,

(2) N is the total number of technical domains (according to Annex IV),

(3) $W_{d,ic}$ is the weighting factor expressed as a percentage of technical domain number d for impact criterion number ic ,

(e) smart readiness scores along the three key functionalities highlighted in Annex Ia, point 2 of Directive 2010/31/EU, SR_f , are determined, using the weighting factors specified according to Annex III, as follows:

$$SR_f = \sum_{ic=1}^M W_f(ic) \times SR_{ic}$$

where:

- (1) M is the total number of impact criteria according to Annex II,
- (2) $W_f(ic)$ is the weighting factor expressed in percentage of impact criterion number ic for key functionality f according to Annex III,
- (3) SR_{ic} is the smart readiness score for impact criterion number ic .

(f) the total smart readiness score SR may be calculated, as a weighted sum of the key functionalities' smart readiness scores, as follows:

$$SR = \sum W_f \times SR_f$$

where:

- (1) SR_f is the smart readiness score for key functionality f ,
- (2) W_f is the weight of key functionality f in the calculation of the total smart readiness scores, with $\sum W_f = 1$.

(g) smart readiness scores of technical domains for each impact criterion $SR_{d,ic}$ may be calculated, as follows:

$$SR_{d,ic} = \frac{I(d, ic)}{I_{max}(d, ic)} \times 100$$

where:

- (1) $I(d, ic)$ is the score of domain number d for impact criterion ic ,
- (2) $I_{max}(d, ic)$ is the maximum score of domain number d for impact criterion number ic .

Annex II on **Smart readiness impact criteria** stipulates that:

The smart readiness impact criteria considered in the calculation protocol set out in Annex I are the following:

- (a) energy efficiency,
- (b) maintenance and fault prediction,
- (c) comfort,
- (d) convenience
- (e) health, well-being and accessibility,
- (f) information to occupants,
- (g) energy flexibility and storage.

Annex III on **Weighting of impact criteria in key functionalities** stipulates that:

1. Each impact criterion set out in Annex II of this Regulation is considered for only one of the three key functionalities, as set out in points 2 to 4. For each key functionality, Member States shall define the respective weighting factors of relevant impact criteria.
2. For the 'energy performance and operation' key functionality, the relevant impact criteria are 'energy efficiency' and 'maintenance and fault prediction'.
3. For the 'response to user needs' key functionality, the relevant impact criteria are 'comfort', 'convenience', 'information to occupants' and 'health, well-being & accessibility'.
4. For the 'energy flexibility' key functionality, the relevant impact criterion is 'energy flexibility & storage'.

Annex IV on **Technical domains** stipulates that:

The smart readiness technical domains considered in the calculation protocol set out in Annex I to this Regulation are the following:

- (a) heating,
- (b) cooling,
- (c) domestic hot water,
- (d) ventilation,
- (e) lighting,
- (f) dynamic building envelope,
- (g) electricity,
- (h) electric vehicle charging,
- (i) monitoring and control.

Annex V on **Weighting of technical domains** stipulates that:

1. Each technical domain is weighted for each of the impact criterion and the weighting factors characterise the influence of the technical domain on the impact criterion.
2. Technical domains' weighting factors are expressed as a percentage, and for each impact criterion, the sum of the weighting factors of the technical domains equals to 100 %.
3. The standard approach to allocate weighting factors to the technical domains is based on:
 - (a) The climatic zone's energy balance for the weighting factors of 'heating', 'cooling', 'domestic hot water', 'ventilation', 'lighting', and 'electricity' technical domains along the 'energy efficiency', 'maintenance and prediction' and 'energy flexibility and storage' impact criteria;
 - (b) for all other cases: weighting factors that are either fixed or equally distributed.
4. Member States define the climatic zones that are used, where relevant, in the determination of weighting factors. For this purpose, Member States may use, where available, relevant Union guidance.
5. The weighting factors of technical domains may differ between residential and non-residential buildings for some impact criteria.
6. Member States define the weighting factors and, for this purpose, are encouraged to use, where available, relevant Union guidance. They may also take into account possible impacts from climate change.

The methodology to calculate the SRI as set out in the delegated regulation and its annexes, is clear; however, a somewhat more accessible summary of the approach is presented below.

The methodology to calculate the SRI is based on the assessment of smart ready services (the level of smart functionality) within nine technical domains (per Annex IV), as shown in the following image.

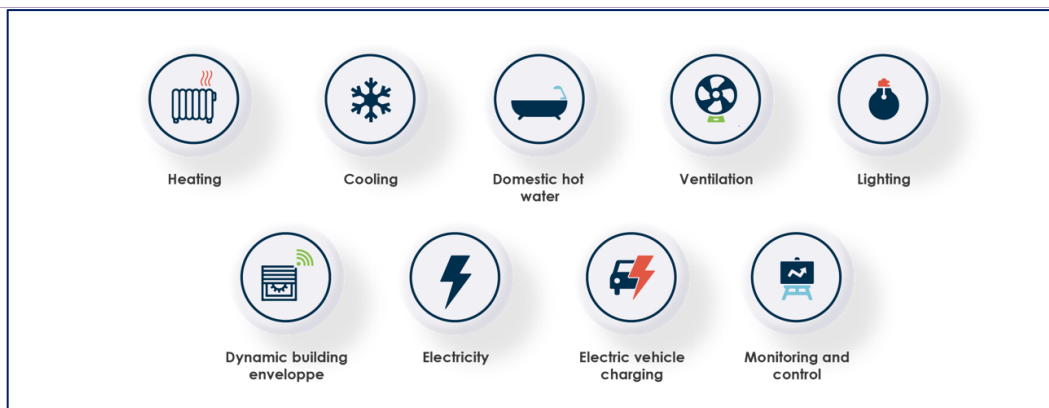


Figure 2. SRI domains

The smartness of each technical domain is determined against the following seven distinct impact criteria (per Annex II):

- Energy efficiency
- Maintenance and fault prediction
- Comfort
- Convenience
- Health, well-being and accessibility
- Information to occupants
- Energy flexibility and storage.

These technical domains and impact criteria are related in an assessment matrix, as illustrated in the following figure:

		I M P A C T S						
		 Energy efficiency	 Maintenance & fault protection	 Comfort	 Convenience	 Health & well-being	 Information to occupants	 Energy flexibility & storage
Total		39%	18%	60%	71%	48%	59%	51%
DOMAINS	 Heating	32%	18%	62%	55%	24%	74%	100%
	 Domestic hot water	17%	0%	45%	70%	67%	83%	0%
	 Cooling	65%	51%	78%	72%	61%	55%	0%
	 Controlled ventilation	41%	0%	55%	60%	34%	44%	-
	 Lighting	85%	14%	90%	100%	83%	15%	-
	 Dynamic building envelope	10%	0%	31%	56%	22%	46%	-
	 Electricity	10%	0%	-	-	-	68%	0%
	 Electric vehicle charging	-	38%	-	82%	-	84%	25%
	 Monitoring & control	52%	43%	62%	72%	45%	64%	14%
		SRI						
		46%						

Figure 3. SRI domains vs. impacts matrix

For each technical domain and impact criterion an EU-wide analysis was conducted¹² of the maximum smartness functionality that is currently available on the market, the lowest level of smartness (usually no smartness at all) and the intermediate levels. If a technical domain in a building is using the maximum smartness functionality for the given impact it scores 100% for that impact criterion; no smartness at all is scored at 0% and intermediate levels of smartness have intermediate values between 0 and 100%. If each technical domain in a building were to attain scores of 100% for a given impact criterion, then the overall score for the building would be 100% for that criterion. If the building were to score 100% for all seven impact criteria, then its overall SRI score would be 100% (the maximum currently achievable).

In reality, not all technical domains contribute equally to any given impact criterion, so weightings are applied based on the relative importance of the domain to the impact criterion (as set out in Annex V). For example, as space heating is typically around 65% of total building energy consumption then its contribution to the overall energy efficiency score would be weighted to reflect its importance, while technical domains that make a smaller contribution would have smaller weightings that are proportional to their contribution.

Annex V stipulates how the weighting of the technical domains is to be derived for each impact criterion. It stipulates that the standard approach to allocate weighting factors to the technical domains based on:

- a) The climatic zone's energy balance for the weighting factors of 'heating', 'cooling', 'domestic hot water', 'ventilation', 'lighting', and 'electricity' technical domains along the 'energy efficiency', 'maintenance and prediction' and 'energy flexibility and storage' impact criteria;
- b) for all other cases: weighting factors that are either fixed or equally distributed.

The Annex further stipulates that

- Member States define the climatic zones that are used, where relevant, in the determination of weighting factors. For this purpose, Member States may use, where available, relevant Union guidance.
- The weighting factors of technical domains may differ between residential and non-residential buildings for some impact criteria.
- Member States define the weighting factors and, for this purpose, are encouraged to use, where available, relevant Union guidance. They may also take into account possible impacts from climate change.

In addition, to the determination of overall scores for each impact criterion the SRI has three **key functionalities** as follows¹³:

- optimise energy efficiency and overall in-use performance
- adapt operation to the needs of the occupant
- adapt to signals from the grid (energy flexibility).

As set out in Annex III, the scores for these key functionalities are derived by combining the overall impact criteria scores that pertain to each key functionality such that:

- optimise energy efficiency and overall in-use performance score is the weighted average combination of the overall energy efficiency score and the overall maintenance and fault protection score
- adapt operation to the needs of the occupant score is the weighted average of the overall scores for comfort, convenience, health and wellbeing and information to occupants scores

¹² <https://op.europa.eu/en/publication-detail/-/publication/f9e6d89d-fbb1-11ea-b44f-01aa75ed71a1>

¹³ These were first set out in the 2018 revision of the EPBD - Amending Energy Performance of Buildings Directive (2018/844/EU) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.156.01.0075.01.ENG

- adapt to signals from the grid (energy flexibility) score is the same as the energy flexibility and storage score.

Member States implementing the SRI are invited to define the weightings mentioned above; however, a priori, it is recommended that an equal weighting be given to each of the constituent impact criterion scores e.g. that for the case of the key functionality of *adapt operation to the needs of the occupant* that each of the constituent impact criterion scores would be weighted equally to determine the key functionality score, etc.

Presenting SRI scores at this level of aggregation helps to give users an intermediate aggregated overview of how well the building performs at these relatively higher levels (compared to the greater detail presented in the matrix of scores). However, it is also possible to give a (related) set of aggregated SRI scores for each impact criterion, as follows:

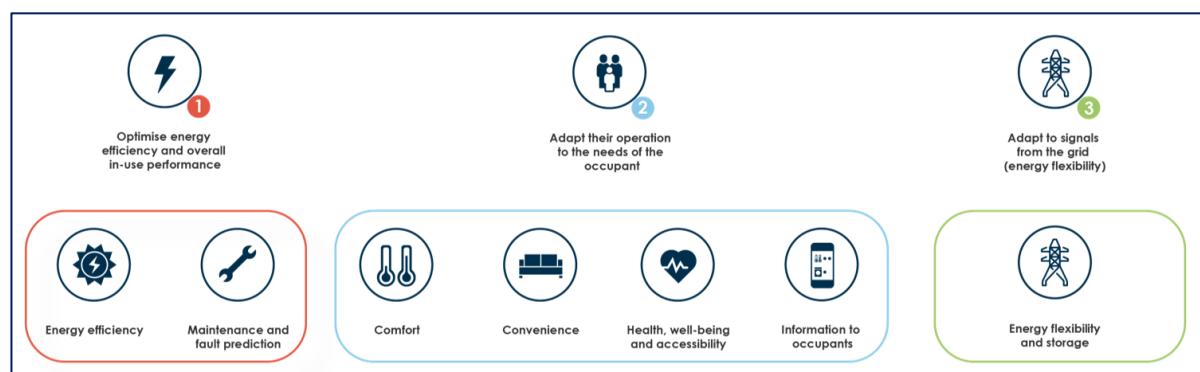


Figure 4. Relationship between impacts and the three key SRI functionality parameters

4 Detailed description of SRI methodology B

Methodology B is the more comprehensive of the two methodologies made available within the European Commission's SRI assessment package¹⁴. It distinguishes SRI services for each of the technical domains and attributes impact scores as a function of the smart level service offered in the building. In summary there are the following number of pre-defined smart ready services per technical domain:

- Heating – 10
- Domestic hot water – 5
- Cooling – 10
- Ventilation – 6
- Lighting – 2
- Dynamic Building Envelope – 3
- Electricity – 7

¹⁴ The assessment package comprising a calculation sheet and a practical guide can be provided upon request by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.

- Electric Vehicle Charging – 3
- Monitoring and control – 8

4.1 Weightings applied

As explained in the delegated regulation (cited in section 3), the SRI applies weightings that are applicable to:

- impact criteria
- technical domains.

These are now discussed in turn.

4.1.1 Domain weightings for each impact criterion

The impact criteria weightings applied in Methodology B are shown in the following table.

Table 1. Impact criteria weightings per domain for Methodology B

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Method B							
Heating	1	1	1	1	1	1	1
Domestic hot water	1	1	0	1	0	1	1
Cooling	1	1	1	1	1	1	1
Ventilation	1	0	1	1	1	1	1
Lighting	1	0	1	1	1	0	0
Electricity	1	1	0	1	0	1	1
Dynamic building envelope	1	0	1	1	1	1	1
Electric vehicle charging	0	1	0	1	0	0	1
Monitoring and control	1	1	1	1	1	1	1

In most cases the scores recorded for each domain towards each overall impact criterion score are weighted equally with a value of 1. Alternatively, in some cases the impacts are weighted as 0 (meaning the domain in question makes no contribution to the impact criterion in question). In most cases the reasons for these weightings are self-evident e.g. the domestic hot water, electricity and electric vehicle charging domains evidently make no contribution to comfort in a building. In some cases it may be less self-evident why a domain makes no contribution to an impact criterion but the reasons are set out in the 2nd Technical Support Study to the SRI¹⁵.

Note, the values applied for these are mostly the same as applied in Methodology A (described in Section 5) but when the values are italicised it indicates that they are different from those applied in Methodology A. In fact, in each of these cases Methodology B has a weighting factor of 1 while Methodology A has a weighting factor of 0; this is because Methodology B is more extensive and it is assumed that the assessment with be more in-depth and hence able to assess a greater set of smart services that have a direct bearing on these impacts.

It is also very important to note that the weighted contribution each aggregate impact score makes to the overall SRI score (and the three principal sub-scores) is shown in Table 2. The weightings shown in Table 2 are fixed in the SRI legislation and hence are applicable across any SRI methodology, including Methodology B and Methodology A.

Table 2. Weighting of Impacts to Make the Aggregate SRI score (and also the three sub-scores)

IMPACT WEIGHTINGS							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
	0.16667	0.33333	0.08333	0.08333	0.08333	0.16667	0.08333

¹⁵ Final report on the technical support to the development of a smart readiness indicator for buildings, VITO/WSEE 2020, https://op.europa.eu/en/publication-detail/-/publication/f9e6d89d-fbb1-11ea-b44f-01aa75ed71a1/language-en?WT.ria_f=3608&WT.ria_ev=search

4.1.2 Climate-related energy balance weightings

Recognising that climate has an impact of building energy balance it is appropriate to weight the impact each domain makes to energy balance sensitive impact criteria in a way that takes account of systematic climatic differences. In particular, the climate-related energy balance weightings are used in Methodology B to weight the contributions made per domain for the energy efficiency, maintenance and fault protection and energy flexibility & storage impact criteria but not the others.

As the average climate can be approximately characterised in geographical boundaries the SRI Methodology B defines domain-specific energy balance weightings as a function of the following climates:

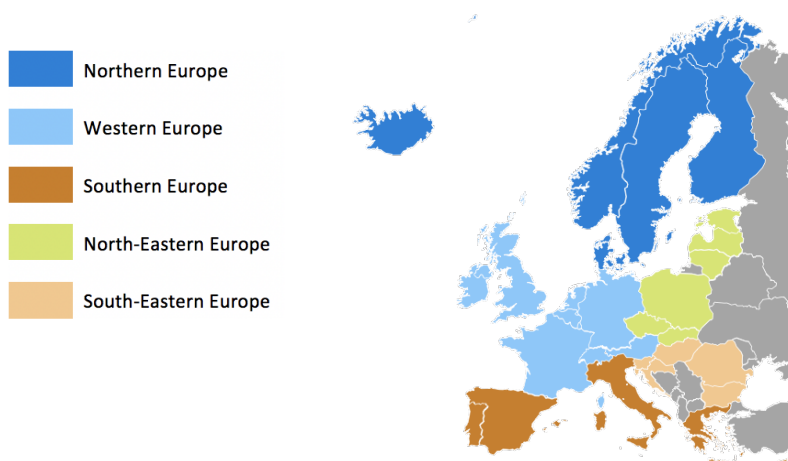


Figure 5. Climate regions applied in the default SRI service catalogue

The specific weighting domain weightings applied vary as a function of residential or non-residential buildings as set out in the following tables:

Table 3. Methodology B energy efficiency domain weightings by climatic region for residential buildings

RESIDENTIAL WEIGHTINGS	North	West	South	North-East	South-East
Heating	39.9	45.3	42.2	40.5	27.5
DHW	12.4	10.2	13.3	18.6	7.7
Cooling	0.0	4.1	9.2	0.0	19.5
Ventilation	25.0	23.8	12.3	25.4	14.4
Lighting	4.9	2.0	3.6	0.8	1.2
Electricity	17.8	14.8	19.5	14.7	29.6

Table 4. Methodology B energy efficiency domain weightings by climatic region for non-residential buildings

NON RESIDENTIAL WEIGHTINGS	North	West	South	North-East	South-East
Heating	41.8	36.4	40.3	39.0	38.3
DHW	7.2	11.0	14.3	12.5	15.4
Cooling	12.5	16.9	15.7	11.2	9.9
Ventilation	26.2	19.1	11.7	24.4	20.1
Lighting	10.4	13.8	16.0	9.7	11.9
Electricity	2.0	2.8	2.1	3.1	4.4

The basis for these values is set out in the in the 2nd Technical Support Study to the SRI¹⁴, but essentially they are informed by and aligned with values derived for and used in the EPBD's formal Impact Assessment studies.

4.1.3 Net domain and energy balance weightings

4.1.3.1 Residential buildings

Applying the weightings in Table 1, Table 3 and 4 results in the following set of domains weightings for residential buildings.

Table 5. Net Domain and impact weightings for residential buildings in North Europe under Methodology B

North Europe	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.43	0.16	0.1	0.16	0.31	0.11
Domestic hot water	0.09	0.13	0.00	0.1	0.00	0.10	0.11
Cooling	0.00	0.00	0.16	0.1	0.16	0.00	0.11
Ventilation	0.19	0.00	0.16	0.1	0.16	0.20	0.11
Lighting	0.04	0.00	0.16	0.1	0.16	0.00	0.00
Electricity	0.13	0.19	0.00	0.1	0.00	0.14	0.11
Dynamic building envelope	0.05	0.00	0.16	0.1	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.1	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.2	0.20	0.20	0.20

Table 6. Net Domain and impact weightings for residential buildings in West Europe under Methodology B

West Europe	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.34	0.46	0.16	0.10	0.16	0.35	0.11
Domestic hot water	0.08	0.10	0.00	0.10	0.00	0.08	0.11
Cooling	0.03	0.04	0.16	0.10	0.16	0.03	0.11
Ventilation	0.18	0.00	0.16	0.10	0.16	0.18	0.11
Lighting	0.01	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.11	0.15	0.00	0.10	0.00	0.11	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 7. Net Domain and impact weightings for residential buildings in South Europe under Methodology B

South Europe	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.32	0.38	0.16	0.10	0.16	0.33	0.11
Domestic hot water	0.10	0.12	0.00	0.10	0.00	0.10	0.11
Cooling	0.07	0.08	0.16	0.10	0.16	0.07	0.11
Ventilation	0.09	0.00	0.16	0.10	0.16	0.10	0.11
Lighting	0.03	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.15	0.17	0.00	0.10	0.00	0.15	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 8. Net Domain and impact weightings for residential buildings in North East Europe under Methodology B

North-East Europe	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.41	0.16	0.10	0.16	0.31	0.11
Domestic hot water	0.14	0.19	0.00	0.10	0.00	0.14	0.11
Cooling	0.00	0.00	0.16	0.10	0.16	0.00	0.11
Ventilation	0.19	0.00	0.16	0.10	0.16	0.19	0.11
Lighting	0.01	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.11	0.15	0.00	0.10	0.00	0.11	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 9. Net Domain and impact weightings for residential buildings in South East Europe under Methodology B

South-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.21	0.24	0.16	0.10	0.16	0.21	0.11
Domestic hot water	0.06	0.07	0.00	0.10	0.00	0.06	0.11
Cooling	0.15	0.17	0.16	0.10	0.16	0.15	0.11
Ventilation	0.11	0.00	0.16	0.10	0.16	0.11	0.11
Lighting	0.01	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.22	0.26	0.00	0.10	0.00	0.22	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

4.1.3.2 Non-residential buildings

Applying the weightings in Table 1, Table 3 and 4 results in the following set of domains weightings for residential buildings.

Table 10. Net Domain and impact weightings for non-residential buildings in North Europe under Methodology B

North Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.31	0.49	0.16	0.10	0.16	0.35	0.11
Domestic hot water	0.05	0.08	0.00	0.10	0.00	0.06	0.11
Cooling	0.09	0.15	0.16	0.10	0.16	0.10	0.11
Ventilation	0.20	0.00	0.16	0.10	0.16	0.22	0.11
Lighting	0.08	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.02	0.02	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 11. Net Domain and impact weightings for non-residential buildings in West Europe under Methodology B

West Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.27	0.41	0.16	0.10	0.16	0.32	0.11
Domestic hot water	0.08	0.12	0.00	0.10	0.00	0.10	0.11
Cooling	0.13	0.19	0.16	0.10	0.16	0.15	0.11
Ventilation	0.14	0.00	0.16	0.10	0.16	0.17	0.11
Lighting	0.10	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.02	0.03	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 12. Net Domain and impact weightings for non-residential buildings in South Europe under Methodology B

South Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.42	0.16	0.10	0.16	0.36	0.11
Domestic hot water	0.11	0.15	0.00	0.10	0.00	0.13	0.11
Cooling	0.12	0.16	0.16	0.10	0.16	0.14	0.11
Ventilation	0.09	0.00	0.16	0.10	0.16	0.10	0.11
Lighting	0.12	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.02	0.02	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 13. Net Domain and impact weightings for non-residential buildings in North East Europe under Methodology B

North-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.29	0.44	0.16	0.10	0.16	0.32	0.11
Domestic hot water	0.09	0.14	0.00	0.10	0.00	0.10	0.11
Cooling	0.08	0.13	0.16	0.10	0.16	0.09	0.11
Ventilation	0.18	0.00	0.16	0.10	0.16	0.20	0.11
Lighting	0.07	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.02	0.04	0.00	0.10	0.00	0.03	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Table 14. Net Domain and impact weightings for non-residential buildings in South East Europe under Methodology B

South-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.29	0.42	0.16	0.10	0.16	0.33	0.11
Domestic hot water	0.12	0.17	0.00	0.10	0.00	0.13	0.11
Cooling	0.07	0.11	0.16	0.10	0.16	0.08	0.11
Ventilation	0.15	0.00	0.16	0.10	0.16	0.17	0.11
Lighting	0.09	0.00	0.16	0.10	0.16	0.00	0.00
Electricity	0.03	0.05	0.00	0.10	0.00	0.04	0.11
Dynamic building envelope	0.05	0.00	0.16	0.10	0.16	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.20	0.20	0.20	0.20	0.20

4.2 Detailed technical domain descriptions

These are now described in detail for each technical domain. This includes: describing each smart service; describing the various smart functionality levels attributed to that service (from lowest smart functionality to highest); indicating which EN or international standards are relevant in determining the functionality. Following this, subsequent tables indicate the SRI impact scores attributed to the smart service functionality level for each smart service. This structure is repeated for each technical domain with the aim of providing a comprehensive description of the SRI Methodology B as necessitated for the coding into the easySRI calculation engine to be conducted in work package 4. In addition, tables are added at the end of each domain's section that show how the impact scores aggregate for that domain in relation to the functionality level. The purpose of this is to allow detailed analysis by Member States who may be considering adapting the methodology so it is clear how much each service contributes to the SRI score as a function of the smart service functionality. After, the above aspects are set out per domain, the final section presents aggregated impact results across the domains so it is clear to readers how the smart service aggregate across the domains to derive the overall impact as a function of the smart service functionality levels that are adopted. Again, the purpose of presenting this is to allow MS who may be considering amending the default Methodology B to understand the relative contributions across the domains.

4.2.1 Heating

For heating the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels which are mostly fully aligned with those set out in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures*

Descriptions of most of these functions are given in ISO 16484-3 *Building automation and control systems (BACS) — Part 3: Functions*. This standard includes a function list and control schematics.

Table 15. SRI Methodology B space heating services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Heating	H-1a	Heat control - demand side	EN15232 EN ISO 52120-1 EN 16798-9	Heat emission control	No automatic control	Central automatic control (e.g. central thermostat)	Individual room control (e.g. thermostatic valves, or electronic controller)	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
Heating	H-1b	Heat control - demand side	EN15232 EN ISO 52120-1	Emission control for TABS (heating mode)	No automatic control	Central automatic control	Advanced central automatic control	Advanced central automatic control with intermittent operation and/or room temperature feedback control	
Heating	H-1c	Heat control - demand side	EN15232 EN ISO 52120-1	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	No automatic control	Outside temperature compensated control	Demand based control		
Heating	H-1d	Heat control - demand side	EN15232 EN ISO 52120-1	Control of distribution pumps in networks	No automatic control	On off control	Multi-Stage control	Variable speed pump control (pump unit (internal) estimations)	Variable speed pump control (external demand signal)
Heating	H-1f	Heat control - demand side	EN15232 EN ISO 52120-1	Thermal Energy Storage (TES) for building heating (excluding TABS)	Continuous storage operation	Time-scheduled storage operation	Load prediction based storage operation	Heat storage capable of flexible control through grid signals (e.g. DSM)	
Heating	H-2a	Control heat production facilities	EN15232 EN ISO 52120-1	Heat generator control (all except heat pumps)	Constant temperature control	Variable temperature control depending on outdoor temperature	Variable temperature control depending on the load (e.g. depending on supply water temperature set point)		

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Heating	H-2b	Control heat production facilities	EN ISO 52120-1	Heat generator control (for heat pumps)	On/Off-control of heat generator	Multi-stage control of heat generator capacity depending on the load or demand (e.g. on/off of several compressors)	Variable control of heat generator capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	Variable control of heat generator capacity depending on the load AND external signals from grid	
Heating	H-2d	Control heat production facilities	EN15232 EN ISO 52120-1	Sequencing in case of different heat generators	Priorities only based on running time	Control according to fixed priority list: e.g. based on rated energy efficiency	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)
Heating	H-3	Information to occupants and facility managers	EN ISO 52120-1	Report information regarding heating system performance	None	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	Central or remote reporting of current performance KPIs and historical data	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Heating	H-4	Flexibility and grid interaction	EN ISO 52120-1	Flexibility and grid interaction	No automatic control	Scheduled operation of heating system	Self-learning optimal control of heating system	Heating system capable of flexible control through grid signals (e.g. DSM)	Optimized control of heating system based on local predictions and grid signals (e.g. through model predictive control)

The impact scores associated with each heating service functionality level are set out in the tables below:

Table 16. Impact scores per functionality level for SRI Methodology B for space heating services

H-1a		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control (e.g. central thermostat)	1	0	1	1	1	0	0
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)	2	0	2	2	2	0	0
level 3	Individual room control with communication between controllers and to BACS	2	0	2	3	2	1	0
level 4	Individual room control with communication and occupancy detection	3	0	2	3	2	1	0

H-1b		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Advanced central automatic control	1	0	1	2	2	0	0
level 3	Advanced central automatic control with intermittent operation and/or room temperature feedback control	2	0	2	3	2	1	1

H-1b		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Advanced central automatic control	1	0	1	2	2	0	0
level 3	Advanced central automatic control with intermittent operation and/or room temperature feedback control	2	0	2	3	2	1	1

H-1c		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Outside temperature compensated control	1	0	1	1	0	0	0
level 2	Demand based control	2	0	1	1	0	0	0

H-1d		Service group: Heat control - demand side						
Control of distribution pumps in networks								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	On off control	1	0	0	0	0	0	0
level 2	Multi-Stage control	2	0	0	0	0	0	0
level 3	Variable speed pump control (pump unit (internal) estimations)	2	0	0	0	0	0	0
level 4	Variable speed pump control (external demand signal)	2	0	0	0	0	0	0

H-1f		Service group: Heat control - demand side						
Thermal Energy Storage (TES) for building heating (excluding TABS)								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Continuous storage operation	0	0	0	0	0	0	0
level 1	Time-scheduled storage operation	1	0	0	0	0	0	0
level 2	Load prediction based storage operation	2	1	0	0	0	0	0
level 3	Heat storage capable of flexible control through grid signals (e.g. DSM)	2	2	0	0	0	0	0

H-2a		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Constant temperature control	0	0	0	0	0	0	0
level 1	Variable temperature control depending on outdoor temperature	1	0	1	0	0	0	0
level 2	Variable temperature control depending on the load (e.g. depending on supply water temperature set point)	2	0	2	0	0	0	0

H-2b		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	On/Off-control of heat generator	0	0	0	0	0	0	0
level 1	Multi-stage control of heat generator capacity depending on the load or demand (e.g. on/off of several compressors)	1	1	1	0	0	0	0
level 2	Variable control of heat generator capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	2	1	2	0	0	0	0
level 3	Variable control of heat generator capacity depending on the load AND external signals from grid	2	3	2	0	0	0	0

H-2d		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running time	0	0	0	0	0	0	0
level 1	Control according to fixed priority list: e.g. based on rated energy efficiency	1	0	0	0	0	0	0
level 2	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	2	1	0	0	0	0	0
level 3	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	3	2	0	0	0	0	0
level 4	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)	3	3	0	0	0	0	0

H-3		Service group: Information to occupants and facility managers						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Central or remote reporting of current performance KPIs and historical data	1	0	0	0	0	1	2
level 3	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	3	3

H-4		Service group: Flexibility and grid interaction						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Scheduled operation of heating system	1	0	1	1	0	0	0
level 2	Self-learning optimal control of heating system	2	1	2	2	0	0	0
level 3	Heating system capable of flexible control through grid signals (e.g. DSM)	2	3	2	3	0	0	0
level 4	Optimized control of heating system based on local predictions and grid signals (e.g. through model predictive control)	2	3	3	3	1	0	0

The following tables show the relative contribution each smart heating service makes to the contribution that heating makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 17. Relative contribution each heating service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
H-1a	Heat emission control	10.0%	0.0%	16.7%	25.0%	50.0%	0.0%	0.0%	5.0%	22.9%	0.0%
H-1b	Emission control for TABS (Heating mode)	10.0%	0.0%	16.7%	25.0%	50.0%	0.0%	0.0%	5.0%	22.9%	0.0%
H-1c	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	10.0%	0.0%	16.7%	25.0%	0.0%	0.0%	0.0%	5.0%	10.4%	0.0%
H-1d	Control of distribution pumps in networks	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%
H-1f	Thermal Energy Storage (TES) for building heating (excluding TABS)	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%
H-2a	Heat generator control (all except heat pumps)	10.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	5.0%	4.2%	0.0%
H-2b	Heat generator control (for heat pumps)	10.0%	100.0%	16.7%	0.0%	0.0%	0.0%	0.0%	5.0%	4.2%	100.0%
H-2d	Sequencing in case of different heat generators	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%
H-3	Report information regarding heating system performance	10.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	55.0%	25.0%	0.0%
H-4	Flexibility and grid interaction	10.0%	0.0%	16.7%	25.0%	0.0%	0.0%	0.0%	5.0%	10.4%	0.0%
Totals		10	1	6	4	2	1	1	10	7	1

Table 18. Relative contribution each heating service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
H-1a	Heat emission control	11.1%	0.0%	20.0%	28.6%	50.0%	0.0%	0.0%	5.6%	24.6%	0.0%
H-1b	Emission control for TABS (Heating mode)	5.6%	0.0%	10.0%	28.6%	50.0%	0.0%	0.0%	2.8%	22.1%	0.0%
H-1c	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	11.1%	0.0%	10.0%	14.3%	0.0%	0.0%	0.0%	5.6%	6.1%	0.0%
H-1d	Control of distribution pumps in networks	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	0.0%
H-1f	Thermal Energy Storage (TES) for building heating (excluding TABS)	11.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	25.0%
H-2a	Heat generator control (all except heat pumps)	11.1%	0.0%	20.0%	0.0%	0.0%	0.0%	0.0%	5.6%	5.0%	0.0%
H-2b	Heat generator control (for heat pumps)	11.1%	25.0%	20.0%	0.0%	0.0%	0.0%	0.0%	5.6%	5.0%	25.0%
H-2d	Sequencing in case of different heat generators	11.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	25.0%
H-3	Report information regarding heating system performance	5.6%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	52.8%	25.0%	0.0%
H-4	Flexibility and grid interaction	11.1%	25.0%	20.0%	28.6%	0.0%	0.0%	0.0%	5.6%	12.1%	25.0%
Totals		10	4	6	4	2	1	1	10	7	4

Table 19. Relative contribution each heating service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
H-1a	Heat emission control	10.0%	0.0%	18.2%	30.0%	50.0%	33.3%	0.0%	21.7%	24.5%	0.0%
H-1b	Emission control for TABS (Heating mode)	10.0%	0.0%	18.2%	30.0%	50.0%	33.3%	25.0%	21.7%	30.8%	0.0%
H-1c	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	10.0%	0.0%	9.1%	10.0%	0.0%	0.0%	0.0%	5.0%	4.8%	0.0%
H-1d	Control of distribution pumps in networks	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%
H-1f	Thermal Energy Storage (TES) for building heating (excluding TABS)	10.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	20.0%
H-2a	Heat generator control (all except heat pumps)	10.0%	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	5.0%	4.5%	0.0%
H-2b	Heat generator control (for heat pumps)	10.0%	30.0%	18.2%	0.0%	0.0%	0.0%	0.0%	5.0%	4.5%	30.0%
H-2d	Sequencing in case of different heat generators	15.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	20.0%
H-3	Report information regarding heating system performance	5.0%	0.0%	0.0%	0.0%	0.0%	33.3%	75.0%	19.2%	18.8%	0.0%
H-4	Flexibility and grid interaction	10.0%	30.0%	18.2%	30.0%	0.0%	0.0%	0.0%	5.0%	12.0%	30.0%
Totals		10	4	6	4	2	3	2	10	7	4

Table 20. Relative contribution each heating service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
H-1a	Heat emission control	14.3%	0.0%	16.7%	27.3%	40.0%	20.0%	0.0%	17.1%	21.0%	0.0%
H-1b	Emission control for TABS (Heating mode)	9.5%	0.0%	16.7%	27.3%	40.0%	20.0%	25.0%	14.8%	27.2%	0.0%
H-1c	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	9.5%	0.0%	8.3%	9.1%	0.0%	0.0%	0.0%	4.8%	4.4%	0.0%
H-1d	Control of distribution pumps in networks	9.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	0.0%
H-1f	Thermal Energy Storage (TES) for building heating (excluding TABS)	9.5%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	18.2%
H-2a	Heat generator control (all except heat pumps)	9.5%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	4.8%	4.2%	0.0%
H-2b	Heat generator control (for heat pumps)	9.5%	27.3%	16.7%	0.0%	0.0%	0.0%	0.0%	4.8%	4.2%	27.3%
H-2d	Sequencing in case of different heat generators	14.3%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	27.3%
H-3	Report information regarding heating system performance	4.8%	0.0%	0.0%	9.1%	0.0%	60.0%	75.0%	32.4%	21.0%	0.0%
H-4	Flexibility and grid interaction	9.5%	27.3%	25.0%	27.3%	20.0%	0.0%	0.0%	4.8%	18.1%	27.3%
Totals		10	4	6	5	3	3	2	10	7	4

These relative contributions assume each smart service is counted for a given building, however, it is important to be aware that the relevancy of the above smart heating services depends on the nature of the heating system in place. Specifically, buildings with a hydronic heating system will have services H1a, H1-c, H1-d, H1-f one (or both) of H2a or H2b and only H-2d if they have multiple heat generators – the other services (H1b and possibly some of H2a, H2b and H2d) would not be relevant and hence would be zeroed out. Conversely for buildings with thermoactive building systems some of the other services may not be relevant.

4.2.2 Domestic hot water

For domestic hot water the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels which are mostly fully aligned with those set out in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures*

Descriptions of most of these functions are given in ISO 16484-3 *Building automation and control systems (BACS) — Part 3: Functions*. This standard includes a function list and control schematics.

Table 21. SRI Methodology B domestic hot water services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Domestic hot water	DHW-1a	Control DHW production facilities	EN15232 EN ISO 52120-1	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	Automatic control on / off	Automatic control on / off and scheduled charging enable	Automatic control on / off and scheduled charging enable and multi-sensor storage management	Automatic charging control based on local availability of renewables or information from electricity grid (DR, DSM)	
Domestic hot water	DHW-1b	Control DHW production facilities	EN15232 EN ISO 52120-1	Control of DHW storage charging (using hot water generation)	Automatic control on / off	Automatic control on / off and scheduled charging enable	Automatic on/off control, scheduled charging enable and demand-based supply temperature control or multi-sensor storage management	DHW production system capable of automatic charging control based on external signals (e.g. from district heating grid)	

Domestic hot water	DHW-1d	Control DHW production facilities	EN15232 EN ISO 52120-1	Control of DHW storage charging (with solar collector and supplementary heat generation)	Manual selected control of solar energy or heat generation	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge and demand-oriented supply or multi-sensor storage management	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge, demand-oriented supply and return temperature control and multi-sensor storage management	
Domestic hot water	DHW-2b	Control DHW production facilities	EN ISO 52120-1	Sequencing in case of different DHW generators	Priorities only based on running time	Control according to fixed priority list: e.g. based on rated energy efficiency	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Domestic hot water	DHW-3	Control DHW production facilities	EN ISO 52120-1 with some deviations	Information to occupants and facility managers	Report information regarding domestic hot water performance	None	Indication of actual values (e.g. temperatures, submetering energy usage)	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking

The impact scores associated with each domestic hot water service functionality level are set out in the tables below:

Table 22. Impact scores per functionality level for SRI Methodology B for domestic hot water services

code	service	1						
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Automatic control on / off	0	0	0	0	0	0	0
level 1	Automatic control on / off and scheduled charging enable	1	1	0	1	0	0	0
level 2	Automatic control on / off and scheduled charging enable and multi-sensor storage management	2	2	0	2	0	0	0
level 3	Automatic charging control based on local availability of renewables or information from electricity grid (DR, DSM)	2	3	0	2	0	0	0

DHW-1b	Control of DHW storage charging (using hot water generation)	Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Automatic control on / off	0	0	0	0	0	0	0
level 1	Automatic control on / off and scheduled charging enable	1	1	0	1	0	0	0
level 2	Automatic on/off control, scheduled charging enable and demand-based supply temperature control or multi-sensor storage management	2	2	0	2	0	0	0
level 3	DHW production system capable of automatic charging control based on external signals (e.g. from district heating grid)	2	3	0	2	0	0	0

DHW-1d		Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual selected control of solar energy or heat generation	0	0	0	0	0	0	0
level 1	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge	1	0	0	1	0	0	0
level 2	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge and demand-oriented supply or multi-sensor storage management	2	1	0	2	0	0	0
level 3	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge, demand-oriented supply and return temperature control and multi-sensor storage management	3	2	0	2	0	0	0

DHW-2b		Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running time	0	0	0	0	0	0	0
level 1	Control according to fixed priority list: e.g. based on rated energy efficiency	1	0	0	0	0	0	0
level 2	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	2	1	0	0	0	0	0
level 3	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	3	2	0	0	0	0	0
level 4	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)	3	3	0	0	0	0	0

DHW-3		Report information regarding domestic hot water performance						
		Service group: Information to occupants and facility managers						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Indication of actual values (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

The following tables show the relative contribution each smart heating service makes to the contribution that heating makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 23. Relative contribution each domestic hot water service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DHW-1b	Control of DHW storage charging (using hot water generation)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DHW-1d	Control of DHW storage charging (with solar collector and supplementary heat generation)	33.3%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	16.7%	25.0%	0.0%
DHW-2b	Sequencing in case of different DHW generators	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%
DHW-3	Report information regarding domestic hot water performance	33.3%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	66.7%	25.0%	0.0%
Totals		3	0	0	1	0	1	1	3	2	0

Table 24. Relative contribution each domestic hot water service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	14.3%	25.0%	0.0%	25.0%	0.0%	0.0%	0.0%	7.1%	6.3%	25.0%
DHW-1b	Control of DHW storage charging (using hot water generation)	14.3%	25.0%	0.0%	25.0%	0.0%	0.0%	0.0%	7.1%	6.3%	25.0%
DHW-1d	Control of DHW storage charging (with solar collector and supplementary heat generation)	28.6%	25.0%	0.0%	50.0%	0.0%	0.0%	0.0%	14.3%	12.5%	25.0%
DHW-2b	Sequencing in case of different DHW generators	28.6%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	25.0%
DHW-3	Report information regarding domestic hot water performance	14.3%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	57.1%	25.0%	0.0%
Totals		5	4	0	3	0	1	1	5	4	4

Table 25. Relative contribution each domestic hot water service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	18.2%	25.0%	0.0%	33.3%	0.0%	0.0%	0.0%	9.1%	8.3%	25.0%
DHW-1b	Control of DHW storage charging (using hot water generation)	18.2%	25.0%	0.0%	33.3%	0.0%	0.0%	0.0%	9.1%	8.3%	25.0%
DHW-1d	Control of DHW storage charging (with solar collector and supplementary heat generation)	27.3%	25.0%	0.0%	33.3%	0.0%	0.0%	0.0%	13.6%	8.3%	25.0%
DHW-2b	Sequencing in case of different DHW generators	27.3%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.6%	0.0%	25.0%
DHW-3	Report information regarding domestic hot water performance	9.1%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	54.5%	25.0%	0.0%
Totals		5	4	0	3	0	1	1	5	4	4

Table 26. Relative contribution each domestic hot water service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	18.2%	27.3%	0.0%	28.6%	0.0%	0.0%	0.0%	9.1%	7.1%	27.3%
DHW-1b	Control of DHW storage charging (using hot water generation)	18.2%	27.3%	0.0%	28.6%	0.0%	0.0%	0.0%	9.1%	7.1%	27.3%
DHW-1d	Control of DHW storage charging (with solar collector and supplementary heat generation)	27.3%	18.2%	0.0%	28.6%	0.0%	0.0%	0.0%	13.6%	7.1%	18.2%
DHW-2b	Sequencing in case of different DHW generators	27.3%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	13.6%	0.0%	27.3%
DHW-3	Report information regarding domestic hot water performance	9.1%	0.0%	0.0%	14.3%	0.0%	100.0%	100.0%	54.5%	28.6%	0.0%
Totals		5	4	0	4	0	1	1	5	4	4

These relative contributions assume each smart service is counted for a given building, however, it is important to be aware that the relevancy of the above smart domestic hot water services depends on the nature of the hot water system in place. Specifically, the applicability of DHW-1a, 1b or 1d depends on the nature of the hot water generator, while DHW-2b is only relevant if there is more than one DHW generator.

4.2.3 Cooling

For space cooling the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels which are mostly fully aligned with those set out in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures*

Descriptions of most of these functions are given in ISO 16484-3 *Building automation and control systems (BACS) — Part 3: Functions*. This standard includes a function list and control schematics.

EN 16798-9

Table 27. SRI Methodology B space cooling services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Cooling	C-1a	Cooling control - demand side	EN15232 EN ISO 52120-1/ EN 16798-9	Cooling emission control	No automatic control	Central automatic control	Individual room control	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
Cooling	C-1b	Cooling control - demand side	EN15232 EN ISO 52120-1	Emission control for TABS (cooling mode)	No automatic control	Central automatic control	Advanced central automatic control	Advanced central automatic control with intermittent operation and/or room temperature feedback control	
Cooling	C-1c	Cooling control - demand side	EN15232 EN ISO 52120-1	Control of distribution network chilled water temperature (supply or return)	Constant temperature control	Outside temperature compensated control	Demand based control		
Cooling	C-1d	Cooling control - demand side	EN15232 EN ISO 52120-1	Control of distribution pumps in networks	No automatic control	On off control	Multi-Stage control	Variable speed pump control (pump unit (internal) estimations)	Variable speed pump control (external demand signal)

Cooling	C-1f	Cooling control - demand side	EN15232 EN ISO 52120-1	Interlock: avoiding simultaneous heating and cooling in the same room	No interlock	Partial interlock (minimising risk of simultaneous heating and cooling e.g. by sliding setpoints)	Total interlock (control system ensures no simultaneous heating and cooling can take place)		
Cooling	C-1g	Cooling control - demand side	EN15232 EN ISO 52120-1	Control of Thermal Energy Storage (TES) operation	Continuous storage operation	Time-scheduled storage operation	Load prediction based storage operation	Cold storage capable of flexible control through grid signals (e.g. DSM)	
Cooling	C-2a	Control cooling production facilities	EN15232 EN ISO 52120-1	Generator control for cooling	On/Off-control of cooling production	Multi-stage control of cooling production capacity depending on the load or demand (e.g. on/off of several compressors)	Variable control of cooling production capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	Variable control of cooling production capacity depending on the load AND external signals from grid	

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Cooling	C-2b	Control cooling production facilities	EN15232 EN ISO 52120-1	Sequencing of different cooling generators	Priorities only based on running times	Fixed sequencing based on loads only: e.g. depending on the generators characteristics such as absorption chiller vs. centrifugal chiller	Dynamic priorities based on generator efficiency and characteristics (e.g. availability of free cooling)	Load prediction based sequencing: the sequence is based on e.g. COP and available power of a device and the predicted required power	Sequencing based on dynamic priority list, including external signals from grid
Cooling	C-3	Information to occupants and facility managers	EN ISO 52120-1	Report information regarding cooling system performance	None	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	Central or remote reporting of current performance KPIs and historical data	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection

Cooling	C-4	Flexibility and grid interaction	None	Flexibility and grid interaction	No automatic control	Scheduled operation of cooling system	Self-learning optimal control of cooling system	Cooling system capable of flexible control through grid signals (e.g. DSM)	Optimized control of cooling system based on local predictions and grid signals (e.g. through model predictive control)
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The impact scores associated with each cooling service functionality level are set out in the tables below:

Table 28. Impact scores per functionality level for SRI Methodology B for space cooling services

C-1a		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Individual room control	1	0	1	2	2	0	0
level 3	Individual room control with communication between controllers and to BACS	2	0	2	3	2	1	0
level 4	Individual room control with communication and occupancy detection	3	0	2	3	2	1	0

C-1b		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Advanced central automatic control	1	0	1	1	2	0	0
level 3	Advanced central automatic control with intermittent operation and/or room temperature feedback control	2	0	2	3	2	1	1

C-1c		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Constant temperature control	0	0	0	0	0	0	0
level 1	Outside temperature compensated control	1	0	1	1	0	0	0
level 2	Demand based control	2	0	1	1	0	0	0

C-1d		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	On off control	1	0	0	0	0	0	0
level 2	Multi-Stage control	2	0	0	0	0	0	0
level 3	Variable speed pump control (pump unit (internal) estimations)	2	0	0	0	0	0	0
level 4	Variable speed pump control (external demand signal)	2	0	0	0	0	0	0

C-1f		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No interlock	0	0	0	0	0	0	0
level 1	Partial interlock (minimising risk of simultaneous heating and cooling e.g. by sliding setpoints)	2	0	0	0	0	0	0
level 2	Total interlock (control system ensures no simultaneous heating and cooling can take place)	3	0	0	0	0	0	0

C-1g		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Continuous storage operation	0	0	0	0	0	0	0
level 1	Time-scheduled storage operation	1	0	0	0	0	0	0
level 2	Load prediction based storage operation	2	1	0	0	0	0	0
level 3	Cold storage capable of flexible control through grid signals (e.g. DSM)	2	2	0	0	0	0	0

C-2a Generator control for cooling		Service group: Control cooling production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	On/Off-control of cooling production	0	0	0	0	0	0	0
level 1	Multi-stage control of cooling production capacity depending on the load or demand (e.g. on/off of several compressors)	1	1	1	0	0	0	0
level 2	Variable control of cooling production capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	2	1	2	0	0	0	0
level 3	Variable control of cooling production capacity depending on the load AND external signals from grid	2	3	2	0	0	0	0

C-2b Sequencing of different cooling generators		Service group: Control cooling production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running times	0	0	0	0	0	0	0
level 1	Fixed sequencing based on loads only: e.g. depending on the generators characteristics such as absorption chiller vs. centrifugal chiller	1	0	0	0	0	0	0
level 2	Dynamic priorities based on generator efficiency and characteristics (e.g. availability of free cooling)	2	1	0	0	0	0	0
level 3	Load prediction based sequencing: the sequence is based on e.g. COP and available power of a device and the predicted required power	3	2	0	0	0	0	0
level 4	Sequencing based on dynamic priority list, including external signals from grid	3	3	0	0	0	0	0

C-3		Report information regarding cooling system performance						
		Service group: Information to occupants and facility managers						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Central or remote reporting of current performance KPIs and historical data	1	0	0	0	0	1	2
level 3	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	3	3

C-4		Flexibility and grid interaction						
		Service group: Flexibility and grid interaction						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Scheduled operation of cooling system	1	0	1	1	0	0	0
level 2	Self-learning optimal control of cooling system	2	1	2	2	0	0	0
level 3	Cooling system capable of flexible control through grid signals (e.g. DSM)	2	3	2	3	0	0	0
level 4	Optimized control of cooling system based on local predictions and grid signals (e.g. through model predictive control)	2	3	3	3	1	0	0

The following tables show the relative contribution each smart cooling service makes to the contribution that heating makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 29. Relative contribution each cooling service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
C-1a	Cooling emission control	9.1%	0.0%	20.0%	25.0%	50.0%	0.0%	0.0%	4.5%	23.8%	0.0%
C-1b	Emission control for TABS (cooling mode)	9.1%	0.0%	20.0%	25.0%	50.0%	0.0%	0.0%	4.5%	23.8%	0.0%
C-1c	Control of distribution network chilled water temperature (supply or return)	9.1%	0.0%	20.0%	25.0%	0.0%	0.0%	0.0%	4.5%	11.3%	0.0%
C-1d	Control of distribution pumps in networks	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%
C-1f	Interlock: avoiding simultaneous heating and cooling in the same room	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%
C-1g	Control of Thermal Energy Storage (TES) operation	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%
C-2a	Generator control for cooling	9.1%	100.0%	20.0%	0.0%	0.0%	0.0%	0.0%	4.5%	5.0%	100.0%
C-2b	Sequencing of different cooling generators	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%
C-3	Report information regarding cooling system performance	9.1%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	54.5%	25.0%	0.0%
C-4	Flexibility and grid interaction	9.1%	0.0%	20.0%	25.0%	0.0%	0.0%	0.0%	4.5%	11.3%	0.0%
Totals		10	1	5	4	2	1	1	10	6	1

Table 30. Relative contribution each cooling service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
C-1a	Cooling emission control	5.6%	0.0%	14.3%	33.3%	50.0%	0.0%	0.0%	2.8%	24.4%	0.0%
C-1b	Emission control for TABS (cooling mode)	5.6%	0.0%	14.3%	16.7%	50.0%	0.0%	0.0%	2.8%	20.2%	0.0%
C-1c	Control of distribution network chilled water temperature (supply or return)	11.1%	0.0%	14.3%	16.7%	0.0%	0.0%	0.0%	5.6%	7.7%	0.0%
C-1d	Control of distribution pumps in networks	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	0.0%
C-1f	Interlock: avoiding simultaneous heating and cooling in the same room	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%	0.0%
C-1g	Control of Thermal Energy Storage (TES) operation	11.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	25.0%
C-2a	Generator control for cooling	11.1%	25.0%	28.6%	0.0%	0.0%	0.0%	0.0%	5.6%	7.1%	25.0%
C-2b	Sequencing of different cooling generators	11.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	25.0%
C-3	Report information regarding cooling system performance	5.6%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	52.8%	25.0%	0.0%
C-4	Flexibility and grid interaction	11.1%	25.0%	28.6%	33.3%	0.0%	0.0%	0.0%	5.6%	15.5%	25.0%
Totals		10	4	5	4	2	1	1	10	6	4

Table 31. Relative contribution each cooling service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
C-1a	Cooling emission control	9.5%	0.0%	22.2%	30.0%	50.0%	33.3%	0.0%	21.4%	25.6%	0.0%
C-1b	Emission control for TABS (cooling mode)	9.5%	0.0%	22.2%	30.0%	50.0%	33.3%	25.0%	21.4%	31.8%	0.0%
C-1c	Control of distribution network chilled water temperature (supply or return)	9.5%	0.0%	11.1%	10.0%	0.0%	0.0%	0.0%	4.8%	5.3%	0.0%
C-1d	Control of distribution pumps in networks	9.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	0.0%
C-1f	Interlock: avoiding simultaneous heating and cooling in the same room	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%
C-1g	Control of Thermal Energy Storage (TES) operation	9.5%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	20.0%
C-2a	Generator control for cooling	9.5%	30.0%	22.2%	0.0%	0.0%	0.0%	0.0%	4.8%	5.6%	30.0%
C-2b	Sequencing of different cooling generators	14.3%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	20.0%
C-3	Report information regarding cooling system performance	4.8%	0.0%	0.0%	0.0%	0.0%	33.3%	75.0%	19.0%	18.8%	0.0%
C-4	Flexibility and grid interaction	9.5%	30.0%	22.2%	30.0%	0.0%	0.0%	0.0%	4.8%	13.1%	30.0%
Totals		10	4	5	4	2	3	2	10	6	4

Table 32. Relative contribution each cooling service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and in-use performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
C-1a	Cooling emission control	13.6%	0.0%	20.0%	27.3%	40.0%	20.0%	0.0%	16.8%	21.8%	0.0%
C-1b	Emission control for TABS (cooling mode)	9.1%	0.0%	20.0%	27.3%	40.0%	20.0%	25.0%	14.5%	28.1%	0.0%
C-1c	Control of distribution network chilled water temperature (supply or return)	9.1%	0.0%	10.0%	9.1%	0.0%	0.0%	0.0%	4.5%	4.8%	0.0%
C-1d	Control of distribution pumps in networks	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%
C-1f	Interlock: avoiding simultaneous heating and cooling in the same room	13.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%
C-1g	Control of Thermal Energy Storage (TES) operation	9.1%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	18.2%
C-2a	Generator control for cooling	9.1%	27.3%	20.0%	0.0%	0.0%	0.0%	0.0%	4.5%	5.0%	27.3%
C-2b	Sequencing of different cooling generators	13.6%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	27.3%
C-3	Report information regarding cooling system performance	4.5%	0.0%	0.0%	9.1%	0.0%	60.0%	75.0%	32.3%	21.0%	0.0%
C-4	Flexibility and grid interaction	9.1%	27.3%	30.0%	27.3%	20.0%	0.0%	0.0%	4.5%	19.3%	27.3%
Totals		10	4	5	5	3	3	2	10	6	4

These relative contributions assume each smart service is counted for a given building, however, it is important to be aware that the relevancy of the above smart cooling services depends on the nature of the cooling system in place. Specifically, buildings with a hydronic cooling system will have services C1a, C1-c, C1-d, C1-f, C-1g & C-2a but not C-1b and only C-2b if multiple generators are used. Conversely, buildings with thermoactive building systems would include C-1b but not necessarily all of the other services. C-3 and C-4 are relevant in all cases.

4.2.4 Ventilation

For ventilation the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels. These are mostly aligned with functionalities in the old EN 15232 standard, but this has since been supplanted by the EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures* standard. Although EN ISO 52120-1 is mostly aligned with the former EN15232 some of the bigger changes have occurred in the BACS functionalities for ventilation, so now there is only partial alignment between the Commission's SRI service catalogue based on EN15232) and the EN ISO 52120-1 functionality levels.

Descriptions of most of these functions are given in ISO 16484-3 *Building automation and control systems (BACS) — Part 3: Functions*. This standard includes a function list and control schematics.

Table 33. SRI Methodology B ventilation services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Ventilation	V-1a	Air flow control	EN15232 EN ISO 52120-1 Function 4.1 partial alignment with extra differentiation for levels 3 and 4	Supply air flow control at the room level	No ventilation system or manual control	Clock control	Occupancy detection control	Central Demand Control based on air quality sensors (CO ₂ , VOC, humidity, ...)	Local Demand Control based on air quality sensors (CO ₂ , VOC,...) with local flow from/to the zone regulated by dampers
Ventilation	V-1c	Air flow control	EN15232 EN ISO 52120-1 Function 4.5	Air flow or pressure control at the air handler level	No automatic control: Continuously supplies of air flow for a maximum load of all rooms	On off time control: Continuously supplies of air flow for a maximum load of all rooms during nominal occupancy time	Multi-stage control: To reduce the auxiliary energy demand of the fan	Automatic flow or pressure control without pressure reset: Load dependent supplies of air flow for the demand of all connected rooms.	Automatic flow or pressure control with pressure reset: Load dependent supplies of air flow for the demand of all connected rooms (for variable air volume systems with VFD).

Ventilation	V-2c	Air temperature control	EN15232 EN ISO 52120-1 Function 4.9 partial alignment	Heat recovery control: prevention of overheating	Without overheating control	Modulate or bypass heat recovery based on sensors in air exhaust	Modulate or bypass heat recovery based on multiple room temperature sensors or predictive control		
Ventilation	V-2d	Air temperature control	EN15232 EN ISO 52120-1	Supply air temperature control at the air handling unit level	No automatic control	Constant setpoint: A control loop enables to control the supply air temperature, the setpoint is constant and can only be modified by a manual action	Variable set point with outdoor temperature compensation	Variable set point with load dependant compensation. A control loop enables to control the supply air temperature. The setpoint is defined as a function of the loads in the room	

Domain	Code	Service group	Related Standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Ventilation	V-3	Free cooling	EN15232 EN ISO 52120-1	Free cooling with mechanical ventilation system	No automatic control	Night cooling	Free cooling: air flows modulated during all periods of time to minimize the amount of mechanical cooling	H,x- directed control: The amount of outside air and recirculation air are modulated during all periods of time to minimize the amount of mechanical cooling. Calculation is performed on the basis of temperatures and humidity (enthalpy).	
Ventilation	V-6	Feedback - Reporting information	EN ISO 52120-1	Reporting information regarding IAQ	None	Air quality sensors (e.g. CO2) and real time autonomous monitoring	Real time monitoring & historical information of IAQ available to occupants	Real time monitoring & historical information of IAQ available to occupants + warning on maintenance needs or occupant actions (e.g. window opening)	

The impact scores associated with each ventilation service functionality level are set out in the tables below:

Table 34. Impact scores per functionality level for SRI Methodology B for ventilation services

V-1a		Service group: Air flow control						
Supply air flow control at the room level		IMPACTS						
Functionality levels		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No ventilation system or manual control	0	0	0	0	0	0	0
level 1	Clock control	1	0	1	1	1	0	0
level 2	Occupancy detection control	1	0	2	2	2	0	0
level 3	Central Demand Control based on air quality sensors (CO ₂ , VOC, humidity, ...)	2	0	3	3	3	0	0
level 4	Local Demand Control based on air quality sensors (CO ₂ , VOC,...) with local flow from/to the zone regulated by dampers	3	0	3	3	3	0	0

V-1c		Service group: Air flow control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control: Continuously supplies of air flow for a maximum load of all rooms	0	0	0	0	0	0	0
level 1	On off time control: Continuously supplies of air flow for a maximum load of all rooms during nominal occupancy time	1	0	0	0	0	0	0
level 2	Multi-stage control: To reduce the auxiliary energy demand of the fan	2	0	0	0	0	0	0
level 3	Automatic flow or pressure control without pressure reset: Load dependent supplies of air flow for the demand of all connected rooms.	3	0	0	0	0	0	0
level 4	Automatic flow or pressure control with pressure reset: Load dependent supplies of air flow for the demand of all connected rooms (for variable air volume systems with VFD).	3	0	0	0	0	0	0
V-2c		Service group: Air temperature control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Without overheating control	0	0	0	0	0	0	0
level 1	Modulate or bypass heat recovery based on sensors in air exhaust	1	0	1	1	1	0	0
level 2	Modulate or bypass heat recovery based on multiple room temperature sensors or predictive control	2	0	2	2	2	0	0

V-2d		Service group: Air temperature control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Constant setpoint: A control loop enables to control the supply air temperature, the setpoint is constant and can only be modified by a manual	1	0	1	1	0	0	0
level 2	Variable set point with outdoor temperature compensation	2	0	2	1	0	0	0
level 3	Variable set point with load dependant compensation. A control loop enables to control the supply air temperature. The setpoint is defined as a function of the loads in the room	3	0	2	1	0	0	0

V-3		Service group: Free cooling						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Night cooling	1	0	3	2	1	0	0
level 2	Free cooling: air flows modulated during all periods of time to minimize the amount of mechanical cooling	2	0	3	2	1	0	0
level 3	H,x- directed control: The amount of outside air and recirculation air are modulated during all periods of time to minimize the amount of mechanical cooling. Calculation is performed on the basis of temperatures and humidity	3	0	3	2	1	0	0

V-6		Service group: Feedback - Reporting information						
Reporting information regarding IAQ								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Air quality sensors (e.g. CO2) and real time autonomous monitoring	0	0	0	0	2	1	1
level 2	Real time monitoring & historical information of IAQ available to occupants	0	0	0	0	3	1	2
level 3	Real time monitoring & historical information of IAQ available to occupants + warning on maintenance needs or occupant actions (e.g. window opening)	0	0	0	0	3	2	3

The following tables show the relative contribution each smart heating service makes to the contribution that ventilation makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 35. Relative contribution each ventilation service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
V-1a	Supply air flow control at the room level	20.0%	0.0%	16.7%	20.0%	20.0%	0.0%	0.0%	10.0%	14.2%	0.0%
V-1c	Air flow or pressure control at the air handler level	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%	0.0%
V-2c	Heat recovery control:prevention of overheating	20.0%	0.0%	16.7%	20.0%	20.0%	0.0%	0.0%	10.0%	14.2%	0.0%
V-2d	Supply air temperature control at the air handling unit level	20.0%	0.0%	16.7%	20.0%	0.0%	0.0%	0.0%	10.0%	9.2%	0.0%
V-3	Free cooling with mechanical ventilation system	20.0%	0.0%	50.0%	40.0%	20.0%	0.0%	0.0%	10.0%	27.5%	0.0%
V-6	Reporting information regarding IAQ	0.0%	0.0%	0.0%	0.0%	40.0%	100.0%	100.0%	50.0%	35.0%	0.0%
Totals		5	0	4	4	4	1	1	6	5	0

Table 36. Relative contribution each ventilation service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
V-1a	Supply air flow control at the room level	11.1%	0.0%	22.2%	28.6%	25.0%	0.0%	0.0%	5.6%	18.9%	0.0%
V-1c	Air flow or pressure control at the air handler level	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%
V-2c	Heat recovery control:prevention of overheating	22.2%	0.0%	22.2%	28.6%	25.0%	0.0%	0.0%	11.1%	18.9%	0.0%
V-2d	Supply air temperature control at the air handling unit level	22.2%	0.0%	22.2%	14.3%	0.0%	0.0%	0.0%	11.1%	9.1%	0.0%
V-3	Free cooling with mechanical ventilation system	22.2%	0.0%	33.3%	28.6%	12.5%	0.0%	0.0%	11.1%	18.6%	0.0%
V-6	Reporting information regarding IAQ	0.0%	0.0%	0.0%	0.0%	37.5%	100.0%	100.0%	50.0%	34.4%	0.0%
Totals		5	0	4	4	4	1	1	6	5	0

Table 37. Relative contribution each ventilation service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
V-1a	Supply air flow control at the room level	15.4%	0.0%	30.0%	37.5%	33.3%	0.0%	0.0%	7.7%	25.2%	0.0%
V-1c	Air flow or pressure control at the air handler level	23.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.5%	0.0%	0.0%
V-2c	Heat recovery control:prevention of overheating	15.4%	0.0%	20.0%	25.0%	22.2%	0.0%	0.0%	7.7%	16.8%	0.0%
V-2d	Supply air temperature control at the air handling unit level	23.1%	0.0%	20.0%	12.5%	0.0%	0.0%	0.0%	11.5%	8.1%	0.0%
V-3	Free cooling with mechanical ventilation system	23.1%	0.0%	30.0%	25.0%	11.1%	0.0%	0.0%	11.5%	16.5%	0.0%
V-6	Reporting information regarding IAQ	0.0%	0.0%	0.0%	0.0%	33.3%	100.0%	100.0%	50.0%	33.3%	0.0%
Totals		5	0	4	4	4	1	1	6	5	0

Table 38. Relative contribution each ventilation service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
V-1a	Supply air flow control at the room level	21.4%	0.0%	30.0%	37.5%	33.3%	0.0%	0.0%	10.7%	25.2%	0.0%
V-1c	Air flow or pressure control at the air handler level	21.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.7%	0.0%	0.0%
V-2c	Heat recovery control:prevention of overheating	14.3%	0.0%	20.0%	25.0%	22.2%	0.0%	0.0%	7.1%	16.8%	0.0%
V-2d	Supply air temperature control at the air handling unit level	21.4%	0.0%	20.0%	12.5%	0.0%	0.0%	0.0%	10.7%	8.1%	0.0%
V-3	Free cooling with mechanical ventilation system	21.4%	0.0%	30.0%	25.0%	11.1%	0.0%	0.0%	10.7%	16.5%	0.0%
V-6	Reporting information regarding IAQ	0.0%	0.0%	0.0%	0.0%	33.3%	100.0%	100.0%	50.0%	33.3%	0.0%
Totals		5	0	4	4	4	1	1	6	5	0

These relative contributions assume each smart service is counted for a given building, however, it is important to be aware that the relevancy of the above smart ventilation services depends on the nature of the ventilation system in place.

4.2.5 Lighting

For lighting the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels which are fully aligned with a sub-set of those set out in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures*

The standards EN 15193-1 and CEN-TR 16791 are also relevant for lighting services.

Table 39. SRI Methodology B lighting services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Lighting	L-1a	Artificial lighting control	EN15232 EN ISO 52120-1 function 5.1 and EN15193-1	Occupancy control for indoor lighting	Manual on/off switch	Manual on/off switch + additional sweeping extinction signal	Automatic detection (auto on / dimmed or auto off)	Automatic detection (manual on / dimmed or auto off)	
Lighting	L-2	Control artificial lighting power based on daylight levels	EN 15193-1 and CEN-TR 16791 EN ISO 52120-1 function 5.2	Control artificial lighting power based on daylight levels	Manual (central)	Manual (per room / zone)	Automatic switching	Automatic dimming	Automatic dimming including scene-based light control (during time intervals, dynamic and adapted lighting scenes are set, for example, in terms of illuminance level, different correlated colour temperature (CCT) and the possibility to change the light distribution within the space according to e. g. design, human needs, visual tasks)

The impact scores associated with each lighting service functionality level are set out in the tables below:

Table 40. Impact scores per functionality level for SRI Methodology B for lighting services

L-1a		Service group: Artificial lighting control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual on/off switch	0	0	0	0	0	0	0
level 1	Manual on/off switch + additional sweeping extinction signal	1	0	1	1	0	0	0
level 2	Automatic detection (auto on / dimmed or auto off)	2	0	2	2	0	0	0
level 3	Automatic detection (manual on / dimmed or auto off)	3	0	2	2	0	0	0

L-2		Service group: artificial lighting power based on daylight						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual (central)	0	0	0	0	0	0	0
level 1	Manual (per room / zone)	1	0	1	1	0	0	0
level 2	Automatic switching	2	0	1	1	1	0	0
level 3	Automatic dimming	3	0	2	2	2	0	0
level 4	Automatic dimming including scene-based light control (during time intervals, dynamic and adapted lighting scenes are set, for example, in terms of illuminance level, different correlated colour temperature (CCT) and the possibility to change the light distribution within the space according to e. g. design, human needs, visual tasks)	3	0	3	3	3	0	0

The following tables show the relative contribution each smart lighting service makes to the contribution that lighting makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 41. Relative contribution each lighting service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
L-1a	Occupancy control for indoor lighting	50.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	25.0%	25.0%	0.0%
L-2	Control artificial lighting power based on daylight levels	50.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	25.0%	25.0%	0.0%
Totals		2	0	2	2	0	0	0	2	2	0

Table 42. Relative contribution each lighting service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
L-1a	Occupancy control for indoor lighting	50.0%	0.0%	66.7%	66.7%	0.0%	0.0%	0.0%	25.0%	33.3%	0.0%
L-2	Control artificial lighting power based on daylight levels	50.0%	0.0%	33.3%	33.3%	100.0%	0.0%	0.0%	25.0%	41.7%	0.0%
Totals		2	0	2	2	1	0	0	2	2	0

Table 43. Relative contribution each lighting service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
L-1a	Occupancy control for indoor lighting	50.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	25.0%	25.0%	0.0%
L-2	Control artificial lighting power based on daylight levels	50.0%	0.0%	50.0%	50.0%	100.0%	0.0%	0.0%	25.0%	50.0%	0.0%
Totals		2	0	2	2	1	0	0	2	2	0

Table 44. Relative contribution each lighting service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
L-1a	Occupancy control for indoor lighting	50.0%	0.0%	40.0%	40.0%	0.0%	0.0%	0.0%	25.0%	20.0%	0.0%
L-2	Control artificial lighting power based on daylight levels	50.0%	0.0%	60.0%	60.0%	100.0%	0.0%	0.0%	25.0%	55.0%	0.0%
Totals		2	0	2	2	1	0	0	2	2	0

These relative contributions assume each smart service is counted for a given building. In the case of lighting all of the smart services are always relevant.

4.2.6 Dynamic Building Envelope

For the dynamic building envelope, the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels which in only one case are partially aligned with those set out in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures*

Otherwise, there are gaps in the standardisation framework for dynamic building envelope solutions and there are no related descriptions of the functions or functionality levels in other EN or international standards.

Table 45. SRI Methodology B dynamic building envelope services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Dynamic building envelope	DE-1	Window control	EN ISO 52120-1 function 6.1 but not only partial match	Window solar shading control	No sun shading or only manual operation	Motorized operation with manual control	Motorized operation with automatic control based on sensor data	Combined light/blind/HVAC control	Predictive blind control (e.g. based on weather forecast)
Dynamic building envelope	DE-2	Window control	No relevant standard	Window open/closed control, combined with HVAC system	Manual operation or only fixed windows	Open/closed detection to shut down heating or cooling systems	Level 1 + Automated mechanical window opening based on room sensor data	Level 2 + Centralized coordination of operable windows, e.g. to control free natural night cooling	
Dynamic building envelope	DE-4	Feedback - Reporting information	No relevant standard	Reporting information regarding performance of dynamic building envelope systems	No reporting	Position of each product & fault detection	Position of each product, fault detection & predictive maintenance	Position of each product, fault detection, predictive maintenance, real-time sensor data (wind, lux, temperature...)	Position of each product, fault detection, predictive maintenance, real-time & historical sensor data (wind, lux, temperature...)

The impact scores associated with each dynamic building envelope service functionality level are set out in the tables below:

Table 46. Impact scores per functionality level for SRI Methodology B for dynamic building envelope services

DE-1		Service group: Window control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No sun shading or only manual operation	0	0	0	0	0	0	0
level 1	Motorized operation with manual control	1	0	1	1	0	0	0
level 2	Motorized operation with automatic control based on sensor data	2	0	1	2	1	0	0
level 3	Combined light/blind/HVAC control	3	0	2	3	2	0	0
level 4	Predictive blind control (e.g. based on weather forecast)	3	0	3	3	3	0	0

DE-2		Service group: Window control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual operation or only fixed windows	0	0	0	0	0	0	0
level 1	Open/closed detection to shut down heating or cooling systems	2	0	1	1	0	0	0
level 2	Level 1 + Automised mechanical window opening based on room sensor data	2	0	2	1	1	0	0
level 3	Level 2 + Centralized coordination of operable windows, e.g. to control free natural night cooling	2	0	2	2	1	0	0

DE-4		Service group: Feedback - Reporting information						
Reporting information regarding performance of dynamic building envelope systems								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No reporting	0	0	0	0	0	0	0
level 1	Position of each product & fault detection	0	0	0	0	0	1	1
level 2	Position of each product, fault detection & predictive maintenance	0	0	0	0	0	1	2
level 3	Position of each product, fault detection, predictive maintenance, real-time sensor data (wind, lux, temperature...)	0	0	0	0	0	1	3
level 4	Position of each product, fault detection, predictive maintenance, real-time & historical sensor data (wind, lux, temperature...)	0	0	0	1	0	2	3

The following tables show the relative contribution each smart dynamic envelope service makes to the contribution that dynamic envelope makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 47. Relative contribution each dynamic building envelope service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DE-1	Window solar shading control	33.3%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	16.7%	25.0%	0.0%
DE-2	Window open/closed control, combined with HVAC system	66.7%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	33.3%	25.0%	0.0%
DE-4	ting information regarding performance of dynamic building envelope sy	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	50.0%	25.0%	0.0%
Totals		2	0	2	2	0	1	1	3	3	0

Table 48. Relative contribution each dynamic building envelope service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DE-1	Window solar shading control	50.0%	0.0%	33.3%	66.7%	50.0%	0.0%	0.0%	25.0%	37.5%	0.0%
DE-2	Window open/closed control, combined with HVAC system	50.0%	0.0%	66.7%	33.3%	50.0%	0.0%	0.0%	25.0%	37.5%	0.0%
DE-4	ting information regarding performance of dynamic building envelope sy	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	50.0%	25.0%	0.0%
Totals		2	0	2	2	2	1	1	3	3	0

Table 49. Relative contribution each dynamic building envelope service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DE-1	Window solar shading control	60.0%	0.0%	50.0%	60.0%	66.7%	0.0%	0.0%	30.0%	44.2%	0.0%
DE-2	Window open/closed control, combined with HVAC system	40.0%	0.0%	50.0%	40.0%	33.3%	0.0%	0.0%	20.0%	30.8%	0.0%
DE-4	ting information regarding performance of dynamic building envelope sy	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	50.0%	25.0%	0.0%
Totals		2	0	2	2	2	1	1	3	3	0

Table 50. Relative contribution each dynamic building envelope service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
DE-1	Window solar shading control	60.0%	0.0%	60.0%	50.0%	75.0%	0.0%	0.0%	30.0%	46.3%	0.0%
DE-2	Window open/closed control, combined with HVAC system	40.0%	0.0%	40.0%	33.3%	25.0%	0.0%	0.0%	20.0%	24.6%	0.0%
DE-4	ting information regarding performance of dynamic building envelope sy	0.0%	0.0%	0.0%	16.7%	0.0%	100.0%	100.0%	50.0%	29.2%	0.0%
Totals		2	0	2	3	2	1	1	3	3	0

These relative contributions assume each smart service is counted for a given building, which is always the case for dynamic building envelope smart services.

4.2.7 Electricity

The smart services in the following table are pre-defined under the electricity domain in the Commission's smart services catalogue. At the time the technical characteristics of the Commission's smart services catalogue were defined there were no pertinent standards that addressed these functionalities. Since then the EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures* standard has been issued. However, while this includes some functionalities related to Local energy production (function 7.5) and Smart grid interaction (function 7.7) these are not as sophisticated or detailed as the functionalities defined in the SRI even for those that relate to these specific topics. Thus, this seems to be a domain with a significant standardisation gap.

Table 51. SRI Methodology B electricity services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electricity	E-2	Feedback - Reporting information	IEC 61850-7-420 for energy efficiency IEC 61850-7-420 for Energy Flexibility & storage – both information	Reporting information regarding local electricity generation	None	Current generation data available	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Electricity	E-3	DER - Storage	Weak overlap with EN ISO 52120-1 function 7.5	Storage of (locally generated) electricity	None	On site storage of electricity (e.g. electric battery)	On site storage of energy (e.g. electric battery or thermal storage) with controller based on grid signals	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity and possibility to feed back into the grid

Electricity	E-4	DER-Optimization	Weak overlap with EN ISO 52120-1 function 7.5	Optimizing self-consumption of locally generated electricity	None	Scheduling electricity consumption (plug loads, white goods, etc.)	Automated management of local electricity consumption based on current renewable energy availability	Automated management of local electricity consumption based on current and predicted energy needs and renewable energy availability	
Electricity	E-5	DER - Generation Control	Weak overlap with EN ISO 52120-1 function 7.5	Control of combined heat and power plant (CHP)	CHP control based on scheduled runtime management and/or current heat energy demand	CHP runtime control influenced by the fluctuating availability of RES; overproduction will be fed into the grid	CHP runtime control influenced by the fluctuating availability of RES and grid signals; dynamic charging and runtime control to optimise self-consumption of renewables		

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electricity	E-8	DSM- Storage	IEC TC 57 for energy efficiency and energy flexibility & storage,. Weak overlap with EN ISO 52120-1 function 7.7	Support of (micro)grid operation modes	None	Automated management of (building-level) electricity consumption based on grid signals	Automated management of (building-level) electricity consumption and electricity supply to neighbouring buildings (microgrid) or grid	Automated management of (building-level) electricity consumption and supply, with potential to continue limited off-grid operation (island mode)	
Electricity	E-11	Feedback - Reporting information		Reporting information regarding energy storage	None	Current state of charge (SOC) data available	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection

Electricity	E-12	Feedback - Reporting information	Weak overlap with EN ISO 52120-1 function 7.4	Reporting information regarding electricity consumption	None	reporting on current electricity consumption on building level	real-time feedback or benchmarking on building level	real-time feedback or benchmarking on appliance level	real-time feedback or benchmarking on appliance level with automated personalized recommendations
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The impact scores associated with each electricity service functionality level are set out in the tables below:

Table 52. Impact scores per functionality level for SRI Methodology B for electricity services

E-2		Service group: Feedback - Reporting information						
Reporting information regarding local electricity generation								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Current generation data available	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

E-3		Service group: DER - Storage						
Storage of (locally generated) electricity								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	On site storage of electricity (e.g. electric battery)	0	1	0	2	0	0	0
level 2	On site storage of energy (e.g. electric battery or thermal storage) with controller based on grid signals	0	2	0	2	0	0	0
level 3	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity	0	2	0	2	0	0	0
level 4	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity and possibility to feed back into the grid	0	3	0	2	0	0	0

E-4		Service group: DER- Optimization						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Scheduling electricity consumption (plug loads, white goods, etc.)	0	1	0	1	0	0	0
level 2	Automated management of local electricity consumption based on current renewable energy availability	0	2	0	2	0	0	0
level 3	Automated management of local electricity consumption based on current and predicted energy needs and renewable energy availability	0	3	0	2	0	0	0

E-5		Service group: DER - Generation Control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	CHP control based on scheduled runtime management and/or current heat energy demand	0	0	0	0	0	0	0
level 1	CHP runtime control influenced by the fluctuating availability of RES; overproduction will be fed into the grid	1	1	0	1	0	0	0
level 2	CHP runtime control influenced by the fluctuating availability of RES and grid signals; dynamic charging and runtime control to optimise self-consumption of renewables	2	2	0	1	0	0	0

E-8		Service group: DSM- Storage						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Automated management of (building-level) electricity consumption based on grid signals	0	2	0	2	0	0	0
level 2	Automated management of (building-level) electricity consumption and electricity supply to neighbouring buildings (microgrid) or grid	0	2	0	2	0	0	0
level 3	Automated management of (building-level) electricity consumption and supply, with potential to continue limited off-grid operation (island	0	3	0	3	0	0	0

E-11 Reporting information regarding energy storage		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Current state of charge (SOC) data available	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

E-12 Reporting information regarding electricity consumption		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	reporting on current electricity consumption on building level	0	0	0	0	0	0	1
level 2	real-time feedback or benchmarking on building level	1	0	0	0	0	0	2
level 3	real-time feedback or benchmarking on appliance level	2	0	0	0	0	1	3
level 4	real-time feedback or benchmarking on appliance level with automated personalized recommendations	3	0	0	1	0	2	3

The following tables show the relative contribution each smart electricity service makes to the contribution that the electricity domain makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 53. Relative contribution each electricity service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
E-2	Reporting information regarding local electricity generation	33.3%	0.0%	0.0%	0.0%	0.0%	50.0%	33.3%	41.7%	8.3%	0.0%
E-3	Storage of (locally generated) electricity	0.0%	20.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	8.3%	20.0%
E-4	Optimizing self-consumption of locally generated electricity	0.0%	20.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	4.2%	20.0%
E-5	Control of combined heat and power plant (CHP)	33.3%	20.0%	0.0%	16.7%	0.0%	0.0%	0.0%	16.7%	4.2%	20.0%
E-8	Support of (micro)grid operation modes	0.0%	40.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	8.3%	40.0%
E-11	Reporting information regarding energy storage	33.3%	0.0%	0.0%	0.0%	0.0%	50.0%	33.3%	41.7%	8.3%	0.0%
E-12	Reporting information regarding electricity consumption	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	8.3%	0.0%
Totals		3	4	0	4	0	2	3	3	7	4

Table 54. Relative contribution each electricity service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
E-2	Reporting information regarding local electricity generation	20.0%	0.0%	0.0%	0.0%	0.0%	50.0%	33.3%	35.0%	8.3%	0.0%
E-3	Storage of (locally generated) electricity	0.0%	25.0%	0.0%	28.6%	0.0%	0.0%	0.0%	0.0%	7.1%	25.0%
E-4	Optimizing self-consumption of locally generated electricity	0.0%	25.0%	0.0%	28.6%	0.0%	0.0%	0.0%	0.0%	7.1%	25.0%
E-5	Control of combined heat and power plant (CHP)	40.0%	25.0%	0.0%	14.3%	0.0%	0.0%	0.0%	20.0%	3.6%	25.0%
E-8	Support of (micro)grid operation modes	0.0%	25.0%	0.0%	28.6%	0.0%	0.0%	0.0%	0.0%	7.1%	25.0%
E-11	Reporting information regarding energy storage	20.0%	0.0%	0.0%	0.0%	0.0%	50.0%	33.3%	35.0%	8.3%	0.0%
E-12	Reporting information regarding electricity consumption	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	10.0%	8.3%	0.0%
Totals		4	4	0	4	0	2	3	4	7	4

Table 55. Relative contribution each electricity service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
E-2	Reporting information regarding local electricity generation	16.7%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	25.0%	8.3%	0.0%
E-3	Storage of (locally generated) electricity	0.0%	20.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	6.3%	20.0%
E-4	Optimizing self-consumption of locally generated electricity	0.0%	30.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	6.3%	30.0%
E-5	Control of combined heat and power plant (CHP)	33.3%	20.0%	0.0%	12.5%	0.0%	0.0%	0.0%	16.7%	3.1%	20.0%
E-8	Support of (micro)grid operation modes	0.0%	30.0%	0.0%	37.5%	0.0%	0.0%	0.0%	0.0%	9.4%	30.0%
E-11	Reporting information regarding energy storage	16.7%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	25.0%	8.3%	0.0%
E-12	Reporting information regarding electricity consumption	33.3%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	33.3%	8.3%	0.0%
Totals		4	4	0	4	0	3	3	4	7	4

Table 56. Relative contribution each electricity service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
E-2	Reporting information regarding local electricity generation	14.3%	0.0%	0.0%	9.1%	0.0%	33.3%	33.3%	23.8%	10.6%	0.0%
E-3	Storage of (locally generated) electricity	0.0%	27.3%	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	4.5%	27.3%
E-4	Optimizing self-consumption of locally generated electricity	0.0%	27.3%	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	4.5%	27.3%
E-5	Control of combined heat and power plant (CHP)	28.6%	18.2%	0.0%	9.1%	0.0%	0.0%	0.0%	14.3%	2.3%	18.2%
E-8	Support of (micro)grid operation modes	0.0%	27.3%	0.0%	27.3%	0.0%	0.0%	0.0%	0.0%	6.8%	27.3%
E-11	Reporting information regarding energy storage	14.3%	0.0%	0.0%	9.1%	0.0%	33.3%	33.3%	23.8%	10.6%	0.0%
E-12	Reporting information regarding electricity consumption	42.9%	0.0%	0.0%	9.1%	0.0%	33.3%	33.3%	38.1%	10.6%	0.0%
Totals		4	4	0	7	0	3	3	4	7	4

These relative contributions assume each smart service is counted for a given building, however, it is important to be aware that the relevancy of the above smart electricity services depends on the nature of the electricity relevant services in place. Only services E-11 and E-12 are always relevant.

4.2.8 Electric Vehicle Charging

For electric vehicle charging the following smart services are pre-defined in the Commission's smart services catalogue.

For electric vehicle charging the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below. Also included are the relevant standards with regards to the functionality levels. Note, electric vehicle charging is not included in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures* nor, its predecessors EN15232. The most relevant standards are those issued by IEC TC59 and also ISO 15118-20:2022.

Table 57. SRI Methodology B electric vehicle charging services, functionality levels and related standards

Domain	Code	Service group	Related standard	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electric vehicle charging	EV-15	EV Charging	See IEC TC 69 Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks, scope	EV Charging Capacity	not present	ducting (or simple power plug) available	0-9% of parking spaces has recharging points	10-50% of parking spaces has recharging point	>50% of parking spaces has recharging point
Electric vehicle charging	EV-16	EV Charging - Grid	ISO 15118-20:2022 Road vehicles — Vehicle to grid communication interface — Part 20?	EV Charging Grid balancing	Not present (uncontrolled charging)	1-way controlled charging (e.g. including desired departure time and grid signals for optimization)	2-way controlled charging (e.g. including desired departure time and grid signals for optimization)		

Electric vehicle charging	EV-17	EV Charging - connectivity	See IEC TC 69 Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks, scope	EV charging information and connectivity	No information available	Reporting information on EV charging status to occupant	Reporting information on EV charging status to occupant AND automatic identification and authorisation of the driver to the charging station (ISO 15118 compliant)		
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The impact scores associated with each electric vehicle charging service functionality level are set out in the tables below:

Table 58. Impact scores per functionality level for SRI Methodology B for electric vehicle charging services

EV-15		Service group: EV Charging						
EV Charging Capacity								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	not present	0	0	0	0	0	0	0
level 1	ducting (or simple power plug) available	0	0	0	1	0	0	0
level 2	0-9% of parking spaces has recharging points	0	0	0	2	0	0	0
level 3	10-50% of parking spaces has recharging point	0	0	0	3	0	0	0
level 4	>50% of parking spaces has recharging point	0	0	0	3	0	0	0

EV-16		Service group: EV Charging - Grid						
EV Charging Grid balancing								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Not present (uncontrolled charging)	0	-2	0	0	0	0	0
level 1	1-way controlled charging (e.g. including desired departure time and grid signals for optimization)	0	1	0	2	0	0	0
level 2	2-way controlled charging (e.g. including desired departure time and grid signals for optimization)	0	3	0	2	0	0	0

EV-17		Service group: EV Charging - connectivity						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No information available	0	0	0	0	0	0	0
level 1	Reporting information on EV charging status to occupant	0	0	0	1	0	0	2
level 2	Reporting information on EV charging status to occupant AND automatic identification and authorization of the driver to the charging station (ISO 15118 compliant)	0	1	0	1	0	0	3

The following tables show the relative contribution each smart electric vehicle charging service makes to the contribution that electric vehicle charging makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 59. Relative contribution each electric vehicle charging service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
EV-15	EV Charging Capacity	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%
EV-16	EV Charging Grid balancing	0.0%	100.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	12.5%	100.0%
EV-17	EV charging information and connectivity	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	100.0%	0.0%	31.3%	0.0%
Totals		0	1	0	3	0	0	1	0	3	1

Table 60. Relative contribution each electric vehicle charging service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
EV-15	EV Charging Capacity	0.0%	0.0%	0.0%	40.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%
EV-16	EV Charging Grid balancing	0.0%	75.0%	0.0%	40.0%	0.0%	0.0%	0.0%	0.0%	10.0%	75.0%
EV-17	EV charging information and connectivity	0.0%	25.0%	0.0%	20.0%	0.0%	0.0%	100.0%	0.0%	30.0%	25.0%
Totals		0	2	0	3	0	0	1	0	3	2

Table 61. Relative contribution each electric vehicle charging service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
EV-15	EV Charging Capacity	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%
EV-16	EV Charging Grid balancing	0.0%	75.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	8.3%	75.0%
EV-17	EV charging information and connectivity	0.0%	25.0%	0.0%	16.7%	0.0%	0.0%	100.0%	0.0%	29.2%	25.0%
Totals		0	2	0	3	0	0	1	0	3	2

Table 62. Relative contribution each electric vehicle charging service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
EV-15	EV Charging Capacity	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%
EV-16	EV Charging Grid balancing	0.0%	75.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	8.3%	75.0%
EV-17	EV charging information and connectivity	0.0%	25.0%	0.0%	16.7%	0.0%	0.0%	100.0%	0.0%	29.2%	25.0%
Totals		0	2	0	3	0	0	1	0	3	2

These relative contributions assume each smart service is counted for a given building. In the case of electric vehicle charging all the smart services are relevant.

4.2.9 Monitoring and control

For monitoring and control the smart services that are pre-defined in the Commission's smart services catalogue v4.5 are set out in the table below.

Note, monitoring and control is not included in EN ISO EN ISO 52120-1. *Energy performance of buildings: Contribution of building automation, controls and building management - Part 1: General framework and procedures* nor, its predecessors EN15232.

Thus, there appears to be a standardisation gap for this domain.

Table 63. SRI Methodology B monitoring and control services, functionality levels and related standards

Domain	Code	Service group	Related standards	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Monitoring and control	MC-3	HVAC interaction control		Run time management of HVAC systems	Manual setting	Runtime setting of heating and cooling plants following a predefined time schedule	Heating and cooling plant on/off control based on building loads	Heating and cooling plant on/off control based on predictive control or grid signals	
Monitoring and control	MC-4	Fault detection		Detecting faults of technical building systems and providing support to the diagnosis of these faults	No central indication of detected faults and alarms	With central indication of detected faults and alarms for at least 2 relevant TBS	With central indication of detected faults and alarms for all relevant TBS	With central indication of detected faults and alarms for all relevant TBS, including diagnosing functions	
Monitoring and control	MC-9	TBS interaction control		Occupancy detection: connected services	None	Occupancy detection for individual functions, e.g. lighting	Centralised occupant detection which feeds in to several TBS such as lighting and heating		
Monitoring and control	MC-13	Feedback - Reporting information		Central reporting of TBS performance and energy use	None	Central or remote reporting of real-time energy use per energy carrier	Central or remote reporting of real-time energy use per energy carrier, combining TBS of at least 2 domains in one interface	Central or remote reporting of real-time energy use per energy carrier, combining TBS of all main domains in one interface	

Monitoring and control	MC-25	Smart Grid Integration		Smart Grid Integration	None - No harmonization between grid and TBS; building is operated independently from the grid load	Demand side management possible for (some) individual TBS, but not coordinated over various domains	Coordinated demand side management of multiple TBS		
Domain	Code	Service group	Related standards	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Monitoring and control	MC-28	Feedback - Reporting information		Reporting information regarding demand side management performance and operation	None	Reporting information on current DSM status, including managed energy flows	Reporting information on current historical and predicted DSM status, including managed energy flows		
Monitoring and control	MC-29	Override control		Override of DSM control	No DSM control	DSM control without the possibility to override this control by the building user (occupant or facility manager)	Manual override and reactivation of DSM control by the building user	Scheduled override of DSM control (and reactivation) by the building user	Scheduled override of DSM control and reactivation with optimised control
Monitoring and control	MC-30	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals		Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	None	Single platform that allows manual control of multiple TBS	Single platform that allows automated control & coordination between TBS	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	

The impact scores associated with each monitoring and control service functionality level are set out in the tables below:

Table 64. Impact scores per functionality level for SRI Methodology B for monitoring and control services

MC-3		Service group: HVAC interaction control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual setting	0	0	0	0	0	0	0
level 1	Runtime setting of heating and cooling plants following a predefined time schedule	1	1	1	1	0	0	0
level 2	Heating and cooling plant on/off control based on building loads	2	1	2	2	1	0	0
level 3	Heating and cooling plant on/off control based on predictive control or grid signals	3	2	2	3	1	0	0

MC-4		Service group: Fault detection						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No central indication of detected faults and alarms	0	0	0	0	0	0	0
level 1	With central indication of detected faults and alarms for at least 2 relevant TBS	0	0	0	1	1	1	1
level 2	With central indication of detected faults and alarms for all relevant TBS	0	0	0	2	2	2	2
level 3	With central indication of detected faults and alarms for all relevant TBS, including diagnosing functions	0	0	0	3	3	3	3

MC-9		Service group: TBS interaction control						
Occupancy detection: connected services								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Occupancy detection for individual functions, e.g. lighting	1	0	1	1	0	1	0
level 2	Centralised occupant detection which feeds in to several TBS such as lighting and heating	1	0	1	1	0	2	0

MC-13		Service group: Feedback - Reporting information						
Central reporting of TBS performance and energy use								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of realtime energy use per energy carrier	1	0	0	1	0	1	1
level 2	Central or remote reporting of realtime energy use per energy carrier, combining TBS of at least 2 domains in one interface	1	0	0	2	0	2	2
level 3	Central or remote reporting of realtime energy use per energy carrier, combining TBS of all main domains in one interface	1	0	0	3	0	3	3

MC-25		Service group: Smart Grid Integration						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None - No harmonization between grid and TBS; building is operated independently from the grid load	0	0	0	0	0	0	0
level 1	Demand side management possible for (some) individual TBS, but not coordinated over various domains	0	2	0	0	0	0	0
level 2	Coordinated demand side management of multiple TBS	1	3	0	1	0	0	0

MC-28		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Reporting information on current DSM status, including managed energy flows	0	1	0	0	0	0	2
level 2	Reporting information on current historical and predicted DSM status, including managed energy flows	0	2	0	0	0	1	3

MC-29		Service group: Override control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No DSM control	0	0	0	0	0	0	0
level 1	DSM control without the possibility to override this control by the building user (occupant or facility manager)	0	3	-2	0	0	-1	-2
level 2	Manual override and reactivation of DSM control by the building user	0	1	0	1	0	0	0
level 3	Scheduled override of DSM control (and reactivation) by the building user	0	1	0	2	0	1	0
level 4	Scheduled override of DSM control and reactivation with optimised control	0	2	0	3	0	1	0

MC-30		Service group: tion between TBS + optimization of e						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Single platform that allows manual control of multiple TBS	0	0	0	1	0	1	0
level 2	Single platform that allows automated control & coordination between TBS	1	0	0	2	0	1	0
level 3	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	2	0	0	3	0	1	0

The following tables show the relative contribution each smart monitoring and control service makes to the contribution that the monitoring and control domain makes overall to the SRI impact scores as the functionality level is increased from Level 1 to Level 4 (Level zero is not shown because the values are all zero). Note, the relative contribution shown in these tables is just compared to the other services in the same domain. Thus, it is not looking at the relative contribution made across all domains and hence does not include the effect of applying domain weightings.

Table 65. Relative contribution each monitoring and control service makes to the SRI impact scores when all at Functionality level 1

Level 1		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
MC-3	Run time management of HVAC systems	33.3%	14.3%	0.0%	20.0%	0.0%	0.0%	0.0%	16.7%	5.0%	14.3%
MC-4	Its of technical building systems and providing support to the diagnosis o	0.0%	0.0%	0.0%	20.0%	100.0%	33.3%	50.0%	16.7%	42.5%	0.0%
MC-9	Occupancy detection: connected services	33.3%	0.0%	0.0%	20.0%	0.0%	33.3%	0.0%	33.3%	5.0%	0.0%
MC-13	Central reporting of TBS performance and energy use	33.3%	0.0%	0.0%	20.0%	0.0%	33.3%	50.0%	33.3%	17.5%	0.0%
MC-25	Smart Grid Integration	0.0%	28.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.6%
MC-28	ng information regarding demand side management performance and op	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	25.0%	14.3%
MC-29	Override of DSM control	0.0%	42.9%	0.0%	0.0%	0.0%	-33.3%	-100.0%	-16.7%	-25.0%	42.9%
MC-30	control & coordination between TBS + optimization of energy flow based	0.0%	0.0%	0.0%	20.0%	0.0%	33.3%	0.0%	16.7%	5.0%	0.0%
Totals		3	4	0	5	1	5	4	6	7	4

Table 66. Relative contribution each monitoring and control service makes to the SRI impact scores when all at Functionality level 2

Level 2		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
MC-3	Run time management of HVAC systems	33.3%	0.0%	0.0%	18.2%	0.0%	0.0%	0.0%	16.7%	4.5%	0.0%
MC-4	Its of technical building systems and providing support to the diagnosis o	0.0%	0.0%	0.0%	18.2%	0.0%	25.0%	0.0%	12.5%	4.5%	0.0%
MC-9	Occupancy detection: connected services	16.7%	0.0%	0.0%	9.1%	0.0%	25.0%	0.0%	20.8%	2.3%	0.0%
MC-13	Central reporting of TBS performance and energy use	16.7%	0.0%	0.0%	18.2%	0.0%	25.0%	0.0%	20.8%	4.5%	0.0%
MC-25	Smart Grid Integration	16.7%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	8.3%	2.3%	0.0%
MC-28	ng information regarding demand side management performance and op	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	6.3%	0.0%	0.0%
MC-29	Override of DSM control	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%
MC-30	control & coordination between TBS + optimization of energy flow based	16.7%	0.0%	0.0%	18.2%	0.0%	12.5%	0.0%	14.6%	4.5%	0.0%
Totals		5	0	0	7	0	5	0	7	7	0

Table 67. Relative contribution each monitoring and control service makes to the SRI impact scores when all at Functionality level 3 (or the maximum functionality level if less than 3)

Level 3		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
MC-3	Run time management of HVAC systems	37.5%	25.0%	66.7%	18.8%	25.0%	0.0%	0.0%	18.8%	27.6%	25.0%
MC-4	Its of technical building systems and providing support to the diagnosis o	0.0%	0.0%	0.0%	18.8%	75.0%	27.3%	33.3%	13.6%	31.8%	0.0%
MC-9	Occupancy detection: connected services	12.5%	0.0%	33.3%	6.3%	0.0%	18.2%	0.0%	15.3%	9.9%	0.0%
MC-13	Central reporting of TBS performance and energy use	12.5%	0.0%	0.0%	18.8%	0.0%	27.3%	33.3%	19.9%	13.0%	0.0%
MC-25	Smart Grid Integration	12.5%	37.5%	0.0%	6.3%	0.0%	0.0%	0.0%	6.3%	1.6%	37.5%
MC-28	ng information regarding demand side management performance and op	0.0%	25.0%	0.0%	0.0%	0.0%	9.1%	33.3%	4.5%	8.3%	25.0%
MC-29	Override of DSM control	0.0%	12.5%	0.0%	12.5%	0.0%	9.1%	0.0%	4.5%	3.1%	12.5%
MC-30	control & coordination between TBS + optimization of energy flow based	25.0%	0.0%	0.0%	18.8%	0.0%	9.1%	0.0%	17.0%	4.7%	0.0%
Totals		5	4	2	7	2	6	3	8	8	4

Table 68. Relative contribution each monitoring and control service makes to the SRI impact scores when all at Functionality level 4 (or the maximum functionality level if less than 4)

Level 4		IMPACTS							THREE PILLARS		
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants	Pillar 1: Efficiency and inuse performance	Pillar 2: Adaptation to the needs of the occupant	Pillar 3: Energy flexibility
MC-3	Run time management of HVAC systems	37.5%	22.2%	66.7%	17.6%	25.0%	0.0%	0.0%	18.8%	27.3%	22.2%
MC-4	Its of technical building systems and providing support to the diagnosis o	0.0%	0.0%	0.0%	17.6%	75.0%	27.3%	33.3%	13.6%	31.5%	0.0%
MC-9	Occupancy detection: connected services	12.5%	0.0%	33.3%	5.9%	0.0%	18.2%	0.0%	15.3%	9.8%	0.0%
MC-13	Central reporting of TBS performance and energy use	12.5%	0.0%	0.0%	17.6%	0.0%	27.3%	33.3%	19.9%	12.7%	0.0%
MC-25	Smart Grid Integration	12.5%	33.3%	0.0%	5.9%	0.0%	0.0%	0.0%	6.3%	1.5%	33.3%
MC-28	ng information regarding demand side management performance and op	0.0%	22.2%	0.0%	0.0%	0.0%	9.1%	33.3%	4.5%	8.3%	22.2%
MC-29	Override of DSM control	0.0%	22.2%	0.0%	17.6%	0.0%	9.1%	0.0%	4.5%	4.4%	22.2%
MC-30	control & coordination between TBS + optimization of energy flow based	25.0%	0.0%	0.0%	17.6%	0.0%	9.1%	0.0%	17.0%	4.4%	0.0%
Totals		5	4	2	7	2	6	3	8	8	4

These relative contributions assume each smart service is counted for in a given building. In the case of monitoring and control each smart service is always relevant.

4.3 Combined effect of domain scores and weightings

When the impact criteria weightings are applied with the climatic weightings they give weightings by domain that vary as a function of the climatic zone and building type. The climate weightings affect the energy balance and hence affect the energy efficiency, maintenance and fault protection and energy flexibility & storage impacts but not the others. When these are applied to the

Some examples are shown in the following figure:

For non-residential buildings in Northern Europe:

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	31%	49%	20%	10%	25%	35%	11%
Domestic hot water	5%	8%	0%	10%	0%	6%	11%
Cooling	9%	15%	20%	10%	25%	10%	11%
Ventilation	20%	0%	20%	10%	25%	22%	11%
Lighting	8%	0%	20%	10%	0%	0%	0%
Electricity	2%	2%	0%	10%	0%	2%	11%
Dynamic building envelope	5%	0%	20%	10%	25%	5%	11%
Electric vehicle charging	0%	5%	0%	10%	0%	0%	11%
Monitoring and control	20%	20%	0%	20%	0%	20%	20%

For residential buildings in Southern Europe:

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	32%	38%	20%	10%	25%	33%	11%
Domestic hot water	10%	12%	0%	10%	0%	10%	11%
Cooling	7%	8%	20%	10%	25%	7%	11%
Ventilation	9%	0%	20%	10%	25%	10%	11%
Lighting	3%	0%	20%	10%	0%	0%	0%
Electricity	15%	17%	0%	10%	0%	15%	11%
Dynamic building envelope	5%	0%	20%	10%	25%	5%	11%
Electric vehicle charging	0%	5%	0%	10%	0%	0%	11%
Monitoring and control	20%	20%	0%	20%	0%	20%	20%

Figure 6. Examples of default SRI service catalogue weighting factors

5 Detailed description of SRI methodology A

Methodology A is the less comprehensive of the two methodologies made available within the European Commission's SRI assessment package. It distinguishes SRI services for each of the technical domains and attributes impact scores as a function of the smart level service offered in the building. Method A has less smart services than Method B but when a smart service is included it is exactly the same in both methodologies, thus the only difference between the methodologies is the reduced number of services included in Method A.

In summary there are the following number of pre-defined smart ready services per technical domain (the numbers applicable in method B are shown in brackets):

- Heating – 5 (10)
- Domestic hot water – 3 (5)
- Cooling – 4 (10)
- Ventilation – 2 (6)
- Lighting – 1 (2)
- Dynamic Building Envelope – 2 (3)
- Electricity – 4 (7)
- Electric Vehicle Charging – 3 (3)
- Monitoring and control – 3 (8)

Thus, overall while Method B includes 54 smart services Method A only includes a subset of 27.

5.1 Weightings applied

SRI Methodology A allows for weightings to be applied for the following:

- impact criteria
- technical domains.

These are now discussed in turn.

5.1.1 Impact criteria weightings

The impact criteria weightings applied in Methodology A are shown in the following table.

Table 69. Impact criteria weightings per domain for Methodology A

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Method A							
Heating	1	1	1	1	1	1	1
Domestic hot water	1	1	0	1	0	1	1
Cooling	1	1	1	1	1	1	1
Ventilation	1	0	1	1	1	1	1
Lighting	1	0	1	1	0	0	0
Electricity	1	1	0	1	0	1	1
Dynamic building envelope	1	0	1	1	1	1	1
Electric vehicle charging	0	1	0	1	0	0	1
Monitoring and control	1	1	0	1	0	1	1

As with Methodology B in most cases the scores recorded for each domain towards each overall impact criterion score are weighted equally with a value of 1. Alternatively, in some cases the impacts are weighted as 0 (meaning the domain in question makes no contribution to the impact criterion in question). In most cases the reasons for these weightings are self-evident e.g. the domestic hot water, electricity and electric vehicle

charging domains evidently make no contribution to comfort in a building. In some cases it may be less self-evident why a domain makes no contribution to an impact criterion but the reasons are set out in the 2nd Technical Support Study to the SRI¹⁴.

Note, the values applied for these are mostly the same as applied in Methodology B (described in Section 4) but Methodology A has more 0 values as it is a simplified version of Methodology B.

As with Methodology B, the weightings shown in Table 2 are used to weight the contribution that each aggregate impact criterion score makes to the overall SRI score (and to the three relevant sub-scores).

5.1.2 Climate-related energy balance weightings

As was discussed in section 4.1.2 for Methodology B, default climatic-related energy balance weightings are applied based on the average climate applicable in each MS's geography.

The specific weighting domain weightings applied in Methodology A vary as a function of residential or non-residential buildings as set out in the following tables:

Table 70. Methodology A energy balance domain weightings by climatic region for residential buildings

RESIDENTIAL	WEIGHTINGS	North	West	South	North-East	South-East
	Heating	39.9	45.3	42.2	40.5	27.5
	DHW	12.4	10.2	13.3	18.6	7.7
	Cooling	0.0	4.1	9.2	0.0	19.5
	Ventilation	25.0	23.8	12.3	25.4	14.4
	Lighting	4.9	2.0	3.6	0.8	1.2
	Electricity	17.8	14.8	19.5	14.7	29.6

Table 71. Methodology A energy balance domain weightings by climatic region for non-residential buildings

NON RESIDENTIAL	WEIGHTINGS	North	West	South	North-East	South-East
	Heating	41.8	36.4	40.3	39.0	38.3
	DHW	7.2	11.0	14.3	12.5	15.4
	Cooling	12.5	16.9	15.7	11.2	9.9
	Ventilation	26.2	19.1	11.7	24.4	20.1
	Lighting	10.4	13.8	16.0	9.7	11.9
	Electricity	2.0	2.8	2.1	3.1	4.4

The basis for these values is set out in the in the 2nd Technical Support Study to the SRI¹⁴, but essentially they are informed by and aligned with values derived for and used in the EPBD's formal Impact Assessment studies.

5.1.3 Net domain and energy balance weightings

5.1.3.1 Residential buildings

Applying the weightings in Table 2 and Table 70 results in the following set of domains weightings for residential buildings under Methodology A.

Table 72. Net Domain and impact weightings for residential buildings in North Europe under Methodology A

North Europe	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.43	0.20	0.1	0.25	0.31	0.11
Domestic hot water	0.09	0.13	0.00	0.1	0.00	0.10	0.11
Cooling	0.00	0.00	0.20	0.1	0.25	0.00	0.11
Ventilation	0.19	0.00	0.20	0.1	0.25	0.20	0.11
Lighting	0.04	0.00	0.20	0.1	0.00	0.00	0.00
Electricity	0.13	0.19	0.00	0.1	0.00	0.14	0.11
Dynamic building e	0.05	0.00	0.20	0.1	0.25	0.05	0.11
Electric vehicle char	0.00	0.05	0.00	0.1	0.00	0.00	0.11
Monitoring and cor	0.20	0.20	0.00	0.2	0.00	0.20	0.20

Table 73. Net Domain and impact weightings for residential buildings in West Europe under Methodology A

West Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.34	0.46	0.20	0.10	0.25	0.35	0.11
Domestic hot water	0.08	0.10	0.00	0.10	0.00	0.08	0.11
Cooling	0.03	0.04	0.20	0.10	0.25	0.03	0.11
Ventilation	0.18	0.00	0.20	0.10	0.25	0.18	0.11
Lighting	0.01	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.11	0.15	0.00	0.10	0.00	0.11	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 74. Net Domain and impact weightings for residential buildings in South Europe under Methodology A

South Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.32	0.38	0.20	0.10	0.25	0.33	0.11
Domestic hot water	0.10	0.12	0.00	0.10	0.00	0.10	0.11
Cooling	0.07	0.08	0.20	0.10	0.25	0.07	0.11
Ventilation	0.09	0.00	0.20	0.10	0.25	0.10	0.11
Lighting	0.03	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.15	0.17	0.00	0.10	0.00	0.15	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 75. Net Domain and impact weightings for residential buildings in North East Europe under Methodology A

North-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.41	0.20	0.10	0.25	0.31	0.11
Domestic hot water	0.14	0.19	0.00	0.10	0.00	0.14	0.11
Cooling	0.00	0.00	0.20	0.10	0.25	0.00	0.11
Ventilation	0.19	0.00	0.20	0.10	0.25	0.19	0.11
Lighting	0.01	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.11	0.15	0.00	0.10	0.00	0.11	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 76. Net Domain and impact weightings for residential buildings in South East Europe under Methodology A

South-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.21	0.24	0.20	0.10	0.25	0.21	0.11
Domestic hot water	0.06	0.07	0.00	0.10	0.00	0.06	0.11
Cooling	0.15	0.17	0.20	0.10	0.25	0.15	0.11
Ventilation	0.11	0.00	0.20	0.10	0.25	0.11	0.11
Lighting	0.01	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.22	0.26	0.00	0.10	0.00	0.22	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

5.1.3.2 Non-residential buildings

Applying the weightings in Table 1 and Table 71 results in the following set of domains weightings for residential buildings under Methodology A.

Table 77. Net Domain and impact weightings for non-residential buildings in North Europe under Methodology A

North Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.31	0.49	0.20	0.10	0.25	0.35	0.11
Domestic hot water	0.05	0.08	0.00	0.10	0.00	0.06	0.11
Cooling	0.09	0.15	0.20	0.10	0.25	0.10	0.11
Ventilation	0.20	0.00	0.20	0.10	0.25	0.22	0.11
Lighting	0.08	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.02	0.02	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 78. Net Domain and impact weightings for non-residential buildings in West Europe under Methodology A

West Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.27	0.41	0.20	0.10	0.25	0.32	0.11
Domestic hot water	0.08	0.12	0.00	0.10	0.00	0.10	0.11
Cooling	0.13	0.19	0.20	0.10	0.25	0.15	0.11
Ventilation	0.14	0.00	0.20	0.10	0.25	0.17	0.11
Lighting	0.10	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.02	0.03	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 79. Net Domain and impact weightings for non-residential buildings in South Europe under Methodology A

South Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.30	0.42	0.20	0.10	0.25	0.36	0.11
Domestic hot water	0.11	0.15	0.00	0.10	0.00	0.13	0.11
Cooling	0.12	0.16	0.20	0.10	0.25	0.14	0.11
Ventilation	0.09	0.00	0.20	0.10	0.25	0.10	0.11
Lighting	0.12	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.02	0.02	0.00	0.10	0.00	0.02	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 80. Net Domain and impact weightings for non-residential buildings in North East Europe under Methodology A

North-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.29	0.44	0.20	0.10	0.25	0.32	0.11
Domestic hot water	0.09	0.14	0.00	0.10	0.00	0.10	0.11
Cooling	0.08	0.13	0.20	0.10	0.25	0.09	0.11
Ventilation	0.18	0.00	0.20	0.10	0.25	0.20	0.11
Lighting	0.07	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.02	0.04	0.00	0.10	0.00	0.03	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

Table 81. Net Domain and impact weightings for non-residential buildings in South East Europe under Methodology A

South-East Europe							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	0.29	0.42	0.20	0.10	0.25	0.33	0.11
Domestic hot water	0.12	0.17	0.00	0.10	0.00	0.13	0.11
Cooling	0.07	0.11	0.20	0.10	0.25	0.08	0.11
Ventilation	0.15	0.00	0.20	0.10	0.25	0.17	0.11
Lighting	0.09	0.00	0.20	0.10	0.00	0.00	0.00
Electricity	0.03	0.05	0.00	0.10	0.00	0.04	0.11
Dynamic building envelope	0.05	0.00	0.20	0.10	0.25	0.05	0.11
Electric vehicle charging	0.00	0.05	0.00	0.10	0.00	0.00	0.11
Monitoring and control	0.20	0.20	0.00	0.20	0.00	0.20	0.20

5.2 Detailed technical domain descriptions

The smart services applied in each technical domain within Methodology A are now described in detail. This includes: describing each smart service; describing the various smart functionality levels attributed to that service (from lowest smart functionality to highest); indicating which EN or international standards are relevant in determining the functionality. Following this, subsequent tables indicate the SRI impact scores attributed to the smart service functionality level for each smart service. This structure is repeated for each technical domain with the aim of providing a comprehensive description of the SRI Methodology A as necessitated for the coding into the easySRI calculation engine to be conducted in work package 4. In addition, tables are added at the end of each domain's section that show how the impact scores aggregate for that domain in relation to the functionality level. The purpose of this is to allow detailed analysis by Member States who may be considering adapting the methodology so it is clear how much each service contributes to the SRI score as a function of the smart service functionality. After, the above aspects are set out per domain, the final section presents aggregated impact results across the domains so it is clear to readers how the smart service aggregate across the domains to derive the overall impact as a function of the smart service functionality levels that are adopted. Again, the purpose of presenting this is to allow MS who may be considering amending the default Methodology B to understand the relative contributions across the domains.

5.2.1 Heating

For heating the following smart services are pre-defined in the Commission's smart services catalogue:

Table 82. SRI Methodology A space heating services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Heating	H-1a	Heat control - demand side	Heat emission control	No automatic control	Central automatic control (e.g. central thermostat)	Individual room control (e.g. thermostatic valves, or electronic controller)	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
Heating	H-1b	Heat control - demand side	Emission control for TABS (heating mode)	No automatic control	Central automatic control	Advanced central automatic control	Advanced central automatic control with intermittent operation and/or room temperature feedback control	
Heating	H-1c	Heat control - demand side	Control of distribution fluid temperature (supply or return air flow or water flow) - Similar function can be applied to the control of direct electric heating networks	No automatic control	Outside temperature compensated control	Demand based control		
Heating	H-1d	Heat control - demand side	Control of distribution pumps in networks	No automatic control	On off control	Multi-Stage control	Variable speed pump control (pump unit (internal) estimations)	Variable speed pump control (external demand signal)
Heating	H-1f	Heat control - demand side	Thermal Energy Storage (TES) for building heating (excluding TABS)	Continuous storage operation	Time-scheduled storage operation	Load prediction based storage operation	Heat storage capable of flexible control through grid signals (e.g. DSM)	
Heating	H-2a	Control heat production facilities	Heat generator control (all except heat pumps)	Constant temperature control	Variable temperature control depending on outdoor temperature	Variable temperature control depending on the load (e.g. depending on supply water temperature set point)		

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Heating	H-2b	Control heat production facilities	Heat generator control (for heat pumps)	On/Off-control of heat generator	Multi-stage control of heat generator capacity depending on the load or demand (e.g. on/off of several compressors)	Variable control of heat generator capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	Variable control of heat generator capacity depending on the load AND external signals from grid	
Heating	H-2d	Control heat production facilities	Sequencing in case of different heat generators	Priorities only based on running time	Control according to fixed priority list: e.g. based on rated energy efficiency	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)
Heating	H-3	Information to occupants and facility managers	Report information regarding heating system performance	None	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	Central or remote reporting of current performance KPIs and historical data	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Heating	H-4	Flexibility and grid interaction	Flexibility and grid interaction	No automatic control	Scheduled operation of heating system	Self-learning optimal control of heating system	Heating system capable of flexible control through grid signals (e.g. DSM)	Optimized control of heating system based on local predictions and grid signals (e.g. through model predictive control)

The impact scores associated with each heating service functionality level are set out in the tables below. Note these values are the same as for Methodology B except for smart service H-1c Storage and shifting of thermal energy:

Table 83. Impact scores per functionality level for SRI Methodology A for space heating services

H-1a		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control (e.g. central thermostat)	1	0	1	1	1	0	0
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)	2	0	2	2	2	0	0
level 3	Individual room control with communication between controllers and to BACS	2	0	2	3	2	1	0
level 4	Individual room control with communication and occupancy detection	3	0	2	3	2	1	0

H-1b		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Advanced central automatic control	1	0	1	2	2	0	0
level 3	Advanced central automatic control with intermittent operation and/or room temperature feedback control	2	0	2	3	2	1	1

H-1c		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	HW storage vessels available	0	1	0	0	0	0	0
level 2	HW storage vessels controlled based on external signals (from BACS or grid)	0	2	0	0	0	0	0

H-1d		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	On off control	1	0	0	0	0	0	0
level 2	Multi-Stage control	2	0	0	0	0	0	0
level 3	Variable speed pump control (pump unit (internal) estimations)	2	0	0	0	0	0	0
level 4	Variable speed pump control (external demand signal)	2	0	0	0	0	0	0

H-1f		Thermal Energy Storage (TES) for building heating (excluding TABS)						
		Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Continuous storage operation	0	0	0	0	0	0	0
level 1	Time-scheduled storage operation	1	0	0	0	0	0	0
level 2	Load prediction based storage operation	2	1	0	0	0	0	0
level 3	Heat storage capable of flexible control through grid signals (e.g. DSM)	2	2	0	0	0	0	0

H-2a		Heat generator control (all except heat pumps)						
		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Constant temperature control	0	0	0	0	0	0	0
level 1	Variable temperature control depending on outdoor temperature	1	0	1	0	0	0	0
level 2	Variable temperature control depending on the load (e.g. depending on supply water temperature set point)	2	0	2	0	0	0	0

H-2b		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	On/Off-control of heat generator	0	0	0	0	0	0	0
level 1	Multi-stage control of heat generator capacity depending on the load or demand (e.g. on/off of several compressors)	1	1	1	0	0	0	0
level 2	Variable control of heat generator capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	2	1	2	0	0	0	0
level 3	Variable control of heat generator capacity depending on the load AND external signals from grid	2	3	2	0	0	0	0

H-2d		Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running time	0	0	0	0	0	0	0
level 1	Control according to fixed priority list: e.g. based on rated energy efficiency	1	0	0	0	0	0	0
level 2	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	2	1	0	0	0	0	0
level 3	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	3	2	0	0	0	0	0
level 4	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)	3	3	0	0	0	0	0

H-3		Report information regarding heating system performance						
		Service group: Information to occupants and facility management						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Central or remote reporting of current performance KPIs and historical data	1	0	0	0	0	1	2
level 3	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	3	3

H-4		Flexibility and grid interaction						
		Service group: Flexibility and grid interaction						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Scheduled operation of heating system	1	0	1	1	0	0	0
level 2	Self-learning optimal control of heating system	2	1	2	2	0	0	0
level 3	Heating system capable of flexible control through grid signals (e.g. DSM)	2	3	2	3	0	0	0
level 4	Optimized control of heating system based on local predictions and grid signals (e.g. through model predictive control)	2	3	3	3	1	0	0

5.2.2 Domestic hot water

For domestic hot water the following smart services are pre-defined in the Commission's smart services catalogue:

Table 84. SRI Methodology A domestic hot water services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Domestic hot water	DHW-1a	Control DHW production facilities	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	Automatic control on / off	Automatic control on / off and scheduled charging enable	Automatic control on / off and scheduled charging enable and multi-sensor storage management	Automatic charging control based on local availability of renewables or information from electricity grid (DR, DSM)	
Domestic hot water	DHW-1b	Control DHW production facilities	Control of DHW storage charging (using hot water generation)	Automatic control on / off	Automatic control on / off and scheduled charging enable	Automatic on/off control, scheduled charging enable and demand-based supply temperature control or multi-sensor storage management	DHW production system capable of automatic charging control based on external signals (e.g. from district heating grid)	
Domestic hot water	DHW-1d	Control DHW production facilities	Control of DHW storage charging (with solar collector and supplementary heat generation)	Manual selected control of solar energy or heat generation	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge and demand-oriented supply or multi-sensor storage management	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge, demand-oriented supply and return temperature control and multi-sensor storage management	

Domestic hot water	DHW-2b	Control DHW production facilities	Sequencing in case of different DHW generators	Priorities only based on running time	Control according to fixed priority list: e.g. based on rated energy efficiency	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)
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Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Domestic hot water	DHW-3	Information to occupants and facility managers	Report information regarding domestic hot water performance	None	Indication of actual values (e.g. temperatures, submetering energy usage)	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection

The impact scores associated with each domestic hot water service functionality level are set out in the tables below. Note, these are the same as in Methodology B except for the smart service DHW-1b Control of DHW storage charging:

Table 85. Impact scores per functionality level for SRI Methodology A for domestic hot water services

code	service	1						
DHW-1a	Control of DHW storage charging (with direct electric heating or integrated electric heat pump)	Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Automatic control on / off	0	0	0	0	0	0	0
level 1	Automatic control on / off and scheduled charging enable	1	1	0	1	0	0	0
level 2	Automatic control on / off and scheduled charging enable and multi-sensor storage management	2	2	0	2	0	0	0
level 3	Automatic charging control based on local availability of renewables or information from electricity grid (DR, DSM)	2	3	0	2	0	0	0

DHW-1b	Control of DHW storage charging	Service group: Flexibility DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	HW storage vessels available	0	1	0	1	0	0	0
level 2	Automatic charging control based on local availability of renewables or information from electricity grid (DR, DSM)	0	3	0	2	0	0	0

DHW-1d		Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual selected control of solar energy or heat generation	0	0	0	0	0	0	0
level 1	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge	1	0	0	1	0	0	0
level 2	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge and demand-oriented supply or multi-sensor storage management	2	1	0	2	0	0	0
level 3	Automatic control of solar storage charge (Prio. 1) and supplementary storage charge, demand-oriented supply and return temperature control and multi-sensor storage management	3	2	0	2	0	0	0

DHW-2b		Service group: Control DHW production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running time	0	0	0	0	0	0	0
level 1	Control according to fixed priority list: e.g. based on rated energy efficiency	1	0	0	0	0	0	0
level 2	Control according to dynamic priority list (based on current energy efficiency, carbon emissions and capacity of generators, e.g. solar, geothermal heat, cogeneration plant, fossil fuels)	2	1	0	0	0	0	0
level 3	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions and capacity of generators)	3	2	0	0	0	0	0
level 4	Control according to dynamic priority list (based on current AND predicted load, energy efficiency, carbon emissions, capacity of generators AND external signals from grid)	3	3	0	0	0	0	0

DHW-3		Report information regarding domestic hot water performance						
		Service group: Information to occupants and facility managers						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Indication of actual values (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

5.2.3 Cooling

For cooling the following smart services are pre-defined in the Commission's smart services catalogue:

Table 86. SRI Methodology A space cooling services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Cooling	C-1a	Cooling control - demand side	Cooling emission control	No automatic control	Central automatic control	Individual room control	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
Cooling	C-1b	Cooling control - demand side	Emission control for TABS (cooling mode)	No automatic control	Central automatic control	Advanced central automatic control	Advanced central automatic control with intermittent operation and/or room temperature feedback control	
Cooling	C-1c	Cooling control - demand side	Control of distribution network chilled water temperature (supply or return)	Constant temperature control	Outside temperature compensated control	Demand based control		
Cooling	C-1d	Cooling control - demand side	Control of distribution pumps in networks	No automatic control	On off control	Multi-Stage control	Variable speed pump control (pump unit (internal) estimations)	Variable speed pump control (external demand signal)
Cooling	C-1f	Cooling control - demand side	Interlock: avoiding simultaneous heating and cooling in the same room	No interlock	Partial interlock (minimising risk of simultaneous heating and cooling e.g. by sliding setpoints)	Total interlock (control system ensures no simultaneous heating and cooling can take place)		
Cooling	C-1g	Cooling control - demand side	Control of Thermal Energy Storage (TES) operation	Continuous storage operation	Time-scheduled storage operation	Load prediction based storage operation	Cold storage capable of flexible control through grid signals (e.g. DSM)	

Cooling	C-2a	Control cooling production facilities	Generator control for cooling	On/Off-control of cooling production	Multi-stage control of cooling production capacity depending on the load or demand (e.g. on/off of several compressors)	Variable control of cooling production capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	Variable control of cooling production capacity depending on the load AND external signals from grid	
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Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Cooling	C-2b	Control cooling production facilities	Sequencing of different cooling generators	Priorities only based on running times	Fixed sequencing based on loads only: e.g. depending on the generators characteristics such as absorption chiller vs. centrifugal chiller	Dynamic priorities based on generator efficiency and characteristics (e.g. availability of free cooling)	Load prediction based sequencing: the sequence is based on e.g. COP and available power of a device and the predicted required power	Sequencing based on dynamic priority list, including external signals from grid
Cooling	C-3	Information to occupants and facility managers	Report information regarding cooling system performance	None	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	Central or remote reporting of current performance KPIs and historical data	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Cooling	C-4	Flexibility and grid interaction	Flexibility and grid interaction	No automatic control	Scheduled operation of cooling system	Self-learning optimal control of cooling system	Cooling system capable of flexible control through grid signals (e.g. DSM)	Optimized control of cooling system based on local predictions and grid signals (e.g. through model predictive control)

The impact scores associated with each cooling service functionality level are set out in the tables below. Note, these are the same as for Methodology B:

Table 87. Impact scores per functionality level for SRI Methodology A for space cooling services

C-1a		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Individual room control	1	0	1	2	2	0	0
level 3	Individual room control with communication between controllers and to BACS	2	0	2	3	2	1	0
level 4	Individual room control with communication and occupancy detection	3	0	2	3	2	1	0

C-1b		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control	1	0	1	1	1	0	0
level 2	Advanced central automatic control	1	0	1	1	2	0	0
level 3	Advanced central automatic control with intermittent operation and/or room temperature feedback control	2	0	2	3	2	1	1

C-1c		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Constant temperature control	0	0	0	0	0	0	0
level 1	Outside temperature compensated control	1	0	1	1	0	0	0
level 2	Demand based control	2	0	1	1	0	0	0

C-1d		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	On off control	1	0	0	0	0	0	0
level 2	Multi-Stage control	2	0	0	0	0	0	0
level 3	Variable speed pump control (pump unit (internal) estimations)	2	0	0	0	0	0	0
level 4	Variable speed pump control (external demand signal)	2	0	0	0	0	0	0

C-1f		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No interlock	0	0	0	0	0	0	0
level 1	Partial interlock (minimising risk of simultaneous heating and cooling e.g. by sliding setpoints)	2	0	0	0	0	0	0
level 2	Total interlock (control system ensures no simultaneous heating and cooling can take place)	3	0	0	0	0	0	0

C-1g		Service group: Cooling control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Continuous storage operation	0	0	0	0	0	0	0
level 1	Time-scheduled storage operation	1	0	0	0	0	0	0
level 2	Load prediction based storage operation	2	1	0	0	0	0	0
level 3	Cold storage capable of flexible control through grid signals (e.g. DSM)	2	2	0	0	0	0	0

C-2a Generator control for cooling		Service group: Control cooling production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	On/Off-control of cooling production	0	0	0	0	0	0	0
level 1	Multi-stage control of cooling production capacity depending on the load or demand (e.g. on/off of several compressors)	1	1	1	0	0	0	0
level 2	Variable control of cooling production capacity depending on the load or demand (e.g. hot gas bypass, inverter frequency control)	2	1	2	0	0	0	0
level 3	Variable control of cooling production capacity depending on the load AND external signals from grid	2	3	2	0	0	0	0

C-2b Sequencing of different cooling generators		Service group: Control cooling production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Priorities only based on running times	0	0	0	0	0	0	0
level 1	Fixed sequencing based on loads only: e.g. depending on the generators characteristics such as absorption chiller vs. centrifugal chiller	1	0	0	0	0	0	0
level 2	Dynamic priorities based on generator efficiency and characteristics (e.g. availability of free cooling)	2	1	0	0	0	0	0
level 3	Load prediction based sequencing: the sequence is based on e.g. COP and available power of a device and the predicted required power	3	2	0	0	0	0	0
level 4	Sequencing based on dynamic priority list, including external signals from grid	3	3	0	0	0	0	0

C-3		Report information regarding cooling system performance						
		Service group: Information to occupants and facility managers						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of current performance KPIs (e.g. temperatures, submetering energy usage)	1	0	0	0	0	1	1
level 2	Central or remote reporting of current performance KPIs and historical data	1	0	0	0	0	1	2
level 3	Central or remote reporting of performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Central or remote reporting of performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	3	3

C-4		Flexibility and grid interaction						
		Service group: Flexibility and grid interaction						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Scheduled operation of cooling system	1	0	1	1	0	0	0
level 2	Self-learning optimal control of cooling system	2	1	2	2	0	0	0
level 3	Cooling system capable of flexible control through grid signals (e.g. DSM)	2	3	2	3	0	0	0
level 4	Optimized control of cooling system based on local predictions and grid signals (e.g. through model predictive control)	2	3	3	3	1	0	0

5.2.4 Ventilation

For ventilation the following smart services are pre-defined in the Commission's smart services catalogue:

Table 88. SRI Methodology A ventilation services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Ventilation	V-1a	Air flow control	Supply air flow control at the room level	No ventilation system or manual control	Clock control	Occupancy detection control	Central Demand Control based on air quality sensors (CO ₂ , VOC, humidity, ...)	Local Demand Control based on air quality sensors (CO ₂ , VOC,...) with local flow from/to the zone regulated by dampers
Ventilation	V-1c	Air flow control	Air flow or pressure control at the air handler level	No automatic control: Continuously supplies of air flow for a maximum load of all rooms	On off time control: Continuously supplies of air flow for a maximum load of all rooms during nominal occupancy time	Multi-stage control: To reduce the auxiliary energy demand of the fan	Automatic flow or pressure control without pressure reset: Load dependent supplies of air flow for the demand of all connected rooms.	Automatic flow or pressure control with pressure reset: Load dependent supplies of air flow for the demand of all connected rooms (for variable air volume systems with VFD).
Ventilation	V-2c	Air temperature control	Heat recovery control: prevention of overheating	Without overheating control	Modulate or bypass heat recovery based on sensors in air exhaust	Modulate or bypass heat recovery based on multiple room temperature sensors or predictive control		
Ventilation	V-2d	Air temperature control	Supply air temperature control at the air handling unit level	No automatic control	Constant setpoint: A control loop enables to control the supply air temperature, the setpoint is constant and can only be modified by a manual action	Variable set point with outdoor temperature compensation	Variable set point with load dependant compensation. A control loop enables to control the supply air temperature. The setpoint is defined as a function of the loads in the room	

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Ventilation	V-3	Free cooling	Free cooling with mechanical ventilation system	No automatic control	Night cooling	Free cooling: air flows modulated during all periods of time to minimize the amount of mechanical cooling	H,x- directed control: The amount of outside air and recirculation air are modulated during all periods of time to minimize the amount of mechanical cooling. Calculation is performed on the basis of temperatures and humidity (enthalpy).	
Ventilation	V-6	Feedback - Reporting information	Reporting information regarding IAQ	None	Air quality sensors (e.g. CO2) and real time autonomous monitoring	Real time monitoring & historical information of IAQ available to occupants	Real time monitoring & historical information of IAQ available to occupants + warning on maintenance needs or occupant actions (e.g. window opening)	

The impact scores associated with each ventilation service functionality level are set out in the tables below. Note, these are the same as for the identical smart services in Methodology B.

Table 89. Impact scores per functionality level for SRI Methodology A for ventilation services

V-1a		Service group: Air flow control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No ventilation system or manual control	0	0	0	0	0	0	0
level 1	Clock control	1	0	1	1	1	0	0
level 2	Occupancy detection control	1	0	2	2	2	0	0
level 3	Central Demand Control based on air quality sensors (CO ₂ , VOC, humidity, ...)	2	0	3	3	3	0	0
level 4	Local Demand Control based on air quality sensors (CO ₂ , VOC,...) with local flow from/to the zone regulated by dampers	3	0	3	3	3	0	0

V-1c		Service group: Air flow control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control: Continuously supplies of air flow for a maximum load of all rooms	0	0	0	0	0	0	0
level 1	On off time control: Continuously supplies of air flow for a maximum load of all rooms during nominal occupancy time	1	0	0	0	0	0	0
level 2	Multi-stage control: To reduce the auxiliary energy demand of the fan	2	0	0	0	0	0	0
level 3	Automatic flow or pressure control without pressure reset: Load dependent supplies of air flow for the demand of all connected rooms.	3	0	0	0	0	0	0
level 4	Automatic flow or pressure control with pressure reset: Load dependent supplies of air flow for the demand of all connected rooms (for variable air volume systems with VFD).	3	0	0	0	0	0	0

V-2c		Service group: Air temperature control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Without overheating control	0	0	0	0	0	0	0
level 1	Modulate or bypass heat recovery based on sensors in air exhaust	1	0	1	1	1	0	0
level 2	Modulate or bypass heat recovery based on multiple room temperature sensors or predictive control	2	0	2	2	2	0	0

V-2d		Service group: Air temperature control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Constant setpoint: A control loop enables to control the supply air temperature, the setpoint is constant and can only be modified by a manual	1	0	1	1	0	0	0
level 2	Variable set point with outdoor temperature compensation	2	0	2	1	0	0	0
level 3	Variable set point with load dependant compensation. A control loop enables to control the supply air temperature. The setpoint is defined as a function of the loads in the room	3	0	2	1	0	0	0

V-3		Service group: Free cooling						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Night cooling	1	0	3	2	1	0	0
level 2	Free cooling: air flows modulated during all periods of time to minimize the amount of mechanical cooling	2	0	3	2	1	0	0
level 3	H,x- directed control: The amount of outside air and recirculation air are modulated during all periods of time to minimize the amount of mechanical cooling. Calculation is performed on the basis of temperatures and humidity	3	0	3	2	1	0	0

V-6		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Air quality sensors (e.g. CO2) and real time autonomous monitoring	0	0	0	0	2	1	1
level 2	Real time monitoring & historical information of IAQ available to occupants	0	0	0	0	3	1	2
level 3	Real time monitoring & historical information of IAQ available to occupants + warning on maintenance needs or occupant actions (e.g. window opening)	0	0	0	0	3	2	3

5.2.5 Lighting

For lighting the following smart services are pre-defined in the Commission's smart services catalogue:

Table 90. SRI Methodology A lighting services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Lighting	L-1a	Artificial lighting control	Occupancy control for indoor lighting	Manual on/off switch	Manual on/off switch + additional sweeping extinction signal	Automatic detection (auto on / dimmed or auto off)	Automatic detection (manual on / dimmed or auto off)	
Lighting	L-2	Control artificial lighting power based on daylight levels	Control artificial lighting power based on daylight levels	Manual (central)	Manual (per room / zone)	Automatic switching	Automatic dimming	Automatic dimming including scene-based light control (during time intervals, dynamic and adapted lighting scenes are set, for example, in terms of illuminance level, different correlated colour temperature (CCT) and the possibility to change the light distribution within the space according to e. g. design, human needs, visual tasks)

The impact scores associated with each lighting service functionality level are set out in the tables below (these are the same as for Methodology B):

Table 91. Impact scores per functionality level for SRI Methodology A for lighting services

L-1a		Occupancy control for indoor lighting						
		Service group: Artificial lighting control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual on/off switch	0	0	0	0	0	0	0
level 1	Manual on/off switch + additional sweeping extinction signal	1	0	1	1	0	0	0
level 2	Automatic detection (auto on / dimmed or auto off)	2	0	2	2	0	0	0
level 3	Automatic detection (manual on / dimmed or auto off)	3	0	2	2	0	0	0

L-2		Control artificial lighting power based on daylight levels						
		Service group: artificial lighting power based on daylight						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual (central)	0	0	0	0	0	0	0
level 1	Manual (per room / zone)	1	0	1	1	0	0	0
level 2	Automatic switching	2	0	1	1	1	0	0
level 3	Automatic dimming	3	0	2	2	2	0	0
level 4	Automatic dimming including scene-based light control (during time intervals, dynamic and adapted lighting scenes are set, for example, in terms of illuminance level, different correlated colour temperature (CCT) and the possibility to change the light distribution within the space according to e. g. design, human needs, visual tasks)	3	0	3	3	3	0	0

5.2.6 Dynamic Building Envelope

For the dynamic building envelope the following smart services are pre-defined in the Commission's smart services catalogue:

Table 92. SRI Methodology A dynamic building envelope services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Dynamic building envelope	DE-1	Window control	Window solar shading control	No sun shading or only manual operation	Motorized operation with manual control	Motorized operation with automatic control based on sensor data	Combined light/blind/HVAC control	Predictive blind control (e.g. based on weather forecast)
Dynamic building envelope	DE-2	Window control	Window open/closed control, combined with HVAC system	Manual operation or only fixed windows	Open/closed detection to shut down heating or cooling systems	Level 1 + Automated mechanical window opening based on room sensor data	Level 2 + Centralized coordination of operable windows, e.g. to control free natural night cooling	
Dynamic building envelope	DE-4	Feedback - Reporting information	Reporting information regarding performance of dynamic building envelope systems	No reporting	Position of each product & fault detection	Position of each product, fault detection & predictive maintenance	Position of each product, fault detection, predictive maintenance, real-time sensor data (wind, lux, temperature...)	Position of each product, fault detection, predictive maintenance, real-time & historical sensor data (wind, lux, temperature...)

The impact scores associated with each dynamic building envelope service functionality level are set out in the tables below. Note, these are the same as for the same smart services in Methodology B:

Table 93. Impact scores per functionality level for SRI Methodology A for dynamic building envelope services

DE-1		Service group: Window control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No sun shading or only manual operation	0	0	0	0	0	0	0
level 1	Motorized operation with manual control	1	0	1	1	0	0	0
level 2	Motorized operation with automatic control based on sensor data	2	0	1	2	1	0	0
level 3	Combined light/blind/HVAC control	3	0	2	3	2	0	0
level 4	Predictive blind control (e.g. based on weather forecast)	3	0	3	3	3	0	0

DE-2		Service group: Window control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual operation or only fixed windows	0	0	0	0	0	0	0
level 1	Open/closed detection to shut down heating or cooling systems	2	0	1	1	0	0	0
level 2	Level 1 + Automised mechanical window opening based on room sensor data	2	0	2	1	1	0	0
level 3	Level 2 + Centralized coordination of operable windows, e.g. to control free natural night cooling	2	0	2	2	1	0	0

DE-4		Service group: Feedback - Reporting information						
Reporting information regarding performance of dynamic building envelope systems								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No reporting	0	0	0	0	0	0	0
level 1	Position of each product & fault detection	0	0	0	0	0	1	1
level 2	Position of each product, fault detection & predictive maintenance	0	0	0	0	0	1	2
level 3	Position of each product, fault detection, predictive maintenance, real-time sensor data (wind, lux, temperature...)	0	0	0	0	0	1	3
level 4	Position of each product, fault detection, predictive maintenance, real-time & historical sensor data (wind, lux, temperature...)	0	0	0	1	0	2	3

5.2.7 Electricity

For electricity the following smart services are pre-defined in the Commission's smart services catalogue:

Table 94. SRI Methodology A electricity services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electricity	E-2	Feedback - Reporting information	Reporting information regarding local electricity generation	None	Current generation data available	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Electricity	E-3	DER - Storage	Storage of (locally generated) electricity	None	On site storage of electricity (e.g. electric battery)	On site storage of energy (e.g. electric battery or thermal storage) with controller based on grid signals	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity and possibility to feed back into the grid
Electricity	E-4	DER- Optimization	Optimizing self-consumption of locally generated electricity	None	Scheduling electricity consumption (plug loads, white goods, etc.)	Automated management of local electricity consumption based on current renewable energy availability	Automated management of local electricity consumption based on current and predicted energy needs and renewable energy availability	

Electricity	E-5	DER - Generation Control	Control of combined heat and power plant (CHP)	CHP control based on scheduled runtime management and/or current heat energy demand	CHP runtime control influenced by the fluctuating availability of RES; overproduction will be fed into the grid	CHP runtime control influenced by the fluctuating availability of RES and grid signals; dynamic charging and runtime control to optimise self-consumption of renewables		
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Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electricity	E-8	DSM- Storage	Support of (micro)grid operation modes	None	Automated management of (building-level) electricity consumption based on grid signals	Automated management of (building-level) electricity consumption and electricity supply to neighbouring buildings (microgrid) or grid	Automated management of (building-level) electricity consumption and supply, with potential to continue limited off-grid operation (island mode)	
Electricity	E-11	Feedback - Reporting information	Reporting information regarding energy storage	None	Current state of charge (SOC) data available	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Electricity	E-12	Feedback - Reporting information	Reporting information regarding electricity consumption	None	reporting on current electricity consumption on building level	real-time feedback or benchmarking on building level	real-time feedback or benchmarking on appliance level	real-time feedback or benchmarking on appliance level with automated personalized recommendations

The impact scores associated with each electricity service functionality level are set out in the tables below. Note, these are the same as for the equivalent smart services under Methodology B:

Table 95. Impact scores per functionality level for SRI Methodology A for electricity services

E-2		Reporting information regarding local electricity generation						
		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Current generation data available	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

E-3		Storage of (locally generated) electricity						
		Service group: DER - Storage						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	On site storage of electricity (e.g. electric battery)	0	1	0	2	0	0	0
level 2	On site storage of energy (e.g. electric battery or thermal storage) with controller based on grid signals	0	2	0	2	0	0	0
level 3	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity	0	2	0	2	0	0	0
level 4	On site storage of energy (e.g. electric battery or thermal storage) with controller optimising the use of locally generated electricity and possibility to feed back into the grid	0	3	0	2	0	0	0

E-4		Service group: DER- Optimization						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Scheduling electricity consumption (plug loads, white goods, etc.)	0	1	0	1	0	0	0
level 2	Automated management of local electricity consumption based on current renewable energy availability	0	2	0	2	0	0	0
level 3	Automated management of local electricity consumption based on current and predicted energy needs and renewable energy availability	0	3	0	2	0	0	0

E-5		Service group: DER - Generation Control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	CHP control based on scheduled runtime management and/or current heat energy demand	0	0	0	0	0	0	0
level 1	CHP runtime control influenced by the fluctuating availability of RES; overproduction will be fed into the grid	1	1	0	1	0	0	0
level 2	CHP runtime control influenced by the fluctuating availability of RES and grid signals; dynamic charging and runtime control to optimise self-consumption of renewables	2	2	0	1	0	0	0

E-8		Service group: DSM- Storage						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Automated management of (building-level) electricity consumption based on grid signals	0	2	0	2	0	0	0
level 2	Automated management of (building-level) electricity consumption and electricity supply to neighbouring buildings (microgrid) or grid	0	2	0	2	0	0	0
level 3	Automated management of (building-level) electricity consumption and supply, with potential to continue limited off-grid operation (island	0	3	0	3	0	0	0

E-11 Reporting information regarding energy storage		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Current state of charge (SOC) data available	1	0	0	0	0	1	1
level 2	Actual values and historical data	1	0	0	0	0	1	2
level 3	Performance evaluation including forecasting and/or benchmarking	1	0	0	0	0	1	3
level 4	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection	1	0	0	1	0	2	3

E-12 Reporting information regarding electricity consumption		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	reporting on current electricity consumption on building level	0	0	0	0	0	0	1
level 2	real-time feedback or benchmarking on building level	1	0	0	0	0	0	2
level 3	real-time feedback or benchmarking on appliance level	2	0	0	0	0	1	3
level 4	real-time feedback or benchmarking on appliance level with automated personalized recommendations	3	0	0	1	0	2	3

5.2.8 Electric Vehicle Charging

For electric vehicle charging the following smart services are pre-defined in the Commission's smart services catalogue:

Table 96. SRI Methodology A electric vehicle charging services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Electric vehicle charging	EV-15	EV Charging	EV Charging Capacity	not present	ducting (or simple power plug) available	0-9% of parking spaces has recharging points	10-50% of parking spaces has recharging point	>50% of parking spaces has recharging point
Electric vehicle charging	EV-16	EV Charging - Grid	EV Charging Grid balancing	Not present (uncontrolled charging)	1-way controlled charging (e.g. including desired departure time and grid signals for optimization)	2-way controlled charging (e.g. including desired departure time and grid signals for optimization)		
Electric vehicle charging	EV-17	EV Charging - connectivity	EV charging information and connectivity	No information available	Reporting information on EV charging status to occupant	Reporting information on EV charging status to occupant AND automatic identification and authorisation of the driver to the charging station (ISO 15118 compliant)		

The impact scores associated with each electric vehicle charging service functionality level are set out in the tables below. Note, these are the same as for the same smart services in Methodology B:

Table 97. Impact scores per functionality level for SRI Methodology A for electric vehicle charging services

EV-15 EV Charging Capacity		Service group: EV Charging						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	not present	0	0	0	0	0	0	0
level 1	ducting (or simple power plug) available	0	0	0	1	0	0	0
level 2	0-9% of parking spaces has recharging points	0	0	0	2	0	0	0
level 3	10-50% of parking spaces has recharging point	0	0	0	3	0	0	0
level 4	>50% of parking spaces has recharging point	0	0	0	3	0	0	0

EV-16 EV Charging Grid balancing		Service group: EV Charging - Grid						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Not present (uncontrolled charging)	0	-2	0	0	0	0	0
level 1	1-way controlled charging (e.g. including desired departure time and grid signals for optimization)	0	1	0	2	0	0	0
level 2	2-way controlled charging (e.g. including desired departure time and grid signals for optimization)	0	3	0	2	0	0	0

EV-17		Service group: EV Charging - connectivity						
EV charging information and connectivity								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No information available	0	0	0	0	0	0	0
level 1	Reporting information on EV charging status to occupant	0	0	0	1	0	0	2
level 2	Reporting information on EV charging status to occupant AND automatic identification and authorization of the driver to the charging station (ISO 15118 compliant)	0	1	0	1	0	0	3

5.2.9 Monitoring and control

For monitoring and control the following smart services are pre-defined in the Commission's smart services catalogue:

Table 98. SRI Methodology A monitoring and control services, functionality levels and related standards

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Monitoring and control	MC-3	HVAC interaction control	Run time management of HVAC systems	Manual setting	Runtime setting of heating and cooling plants following a predefined time schedule	Heating and cooling plant on/off control based on building loads	Heating and cooling plant on/off control based on predictive control or grid signals	
Monitoring and control	MC-4	Fault detection	Detecting faults of technical building systems and providing support to the diagnosis of these faults	No central indication of detected faults and alarms	With central indication of detected faults and alarms for at least 2 relevant TBS	With central indication of detected faults and alarms for all relevant TBS	With central indication of detected faults and alarms for all relevant TBS, including diagnosing functions	
Monitoring and control	MC-9	TBS interaction control	Occupancy detection: connected services	None	Occupancy detection for individual functions, e.g. lighting	Centralised occupant detection which feeds in to several TBS such as lighting and heating		
Monitoring and control	MC-13	Feedback - Reporting information	Central reporting of TBS performance and energy use	None	Central or remote reporting of real-time energy use per energy carrier	Central or remote reporting of real-time energy use per energy carrier, combining TBS of at least 2 domains in one interface	Central or remote reporting of real-time energy use per energy carrier, combining TBS of all main domains in one interface	
Monitoring and control	MC-25	Smart Grid Integration	Smart Grid Integration	None - No harmonization between grid and TBS; building is operated independently from the grid load	Demand side management possible for (some) individual TBS, but not coordinated over various domains	Coordinated demand side management of multiple TBS		

Domain	Code	Service group	Smart ready service	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Monitoring and control	MC-28	Feedback - Reporting information	Reporting information regarding demand side management performance and operation	None	Reporting information on current DSM status, including managed energy flows	Reporting information on current historical and predicted DSM status, including managed energy flows		
Monitoring and control	MC-29	Override control	Override of DSM control	No DSM control	DSM control without the possibility to override this control by the building user (occupant or facility manager)	Manual override and reactivation of DSM control by the building user	Scheduled override of DSM control (and reactivation) by the building user	Scheduled override of DSM control and reactivation with optimised control
Monitoring and control	MC-30	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	None	Single platform that allows manual control of multiple TBS	Single platform that allows automated control & coordination between TBS	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	

The impact scores associated with each monitoring and control service functionality level are set out in the tables below:

Table 99. Impact scores per functionality level for SRI Methodology A for monitoring and control services

MC-3		Service group: HVAC interaction control						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	Manual setting	0	0	0	0	0	0	0
level 1	Runtime setting of heating and cooling plants following a predefined time schedule	1	1	1	1	0	0	0
level 2	Heating and cooling plant on/off control based on building loads	2	1	2	2	1	0	0
level 3	Heating and cooling plant on/off control based on predictive control or grid signals	3	2	2	3	1	0	0

MC-4		Service group: Fault detection						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No central indication of detected faults and alarms	0	0	0	0	0	0	0
level 1	With central indication of detected faults and alarms for at least 2 relevant TBS	0	0	0	1	1	1	1
level 2	With central indication of detected faults and alarms for all relevant TBS	0	0	0	2	2	2	2
level 3	With central indication of detected faults and alarms for all relevant TBS, including diagnosing functions	0	0	0	3	3	3	3

MC-9		Service group: TBS interaction control						
Occupancy detection: connected services								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Occupancy detection for individual functions, e.g. lighting	1	0	1	1	0	1	0
level 2	Centralised occupant detection which feeds in to several TBS such as lighting and heating	1	0	1	1	0	2	0

MC-13		Service group: Feedback - Reporting information						
Central reporting of TBS performance and energy use								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Central or remote reporting of realtime energy use per energy carrier	1	0	0	1	0	1	1
level 2	Central or remote reporting of realtime energy use per energy carrier, combining TBS of at least 2 domains in one interface	1	0	0	2	0	2	2
level 3	Central or remote reporting of realtime energy use per energy carrier, combining TBS of all main domains in one interface	1	0	0	3	0	3	3

MC-25 Smart Grid Integration		Service group: Smart Grid Integration						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None - No harmonization between grid and TBS; building is operated independently from the grid load	0	0	0	0	0	0	0
level 1	Demand side management possible for (some) individual TBS, but not coordinated over various domains	0	2	0	0	0	0	0
level 2	Coordinated demand side management of multiple TBS	1	3	0	1	0	0	0

MC-28 Reporting information regarding demand side management performance and operation		Service group: Feedback - Reporting information						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Reporting information on current DSM status, including managed energy flows	0	1	0	0	0	0	2
level 2	Reporting information on current historical and predicted DSM status, including managed energy flows	0	2	0	0	0	1	3

MC-29		Service group: Override control						
Override of DSM control								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No DSM control	0	0	0	0	0	0	0
level 1	DSM control without the possibility to override this control by the building user (occupant or facility manager)	0	3	-2	0	0	-1	-2
level 2	Manual override and reactivation of DSM control by the building user	0	1	0	1	0	0	0
level 3	Scheduled override of DSM control (and reactivation) by the building user	0	1	0	2	0	1	0
level 4	Scheduled override of DSM control and reactivation with optimised control	0	2	0	3	0	1	0

MC-30		Service group: ation between TBS + optimization of e						
Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals								
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	Single platform that allows manual control of multiple TBS	0	0	0	1	0	1	0
level 2	Single platform that allows automated control & coordination between TBS	1	0	0	2	0	1	0
level 3	Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals	2	0	0	3	0	1	0

6 Comparison of Method A and Method B

The preceding text in sections 4 and 5 includes detailed descriptions of Methods A and B, the services included (more in B than A), and the (very minor) differences in the impact scoring ascribed per service. It is also relevant to consider how the choice of Method A or B may affect a buildings SRI score and the time taken to conduct an assessment. In principle, Method B provides a more comprehensive assessment but takes more time to conducted, so the trade-off between the two methods is one of time versus accuracy/completeness. The Methods were first developed under the auspices of the 2nd SRI technical support study¹⁴ and towards the end of that study stakeholders were invited to test the methods on their own buildings and share the results with the project team. Most such assessments were done using only one of the two methods but there were 31 cases where both methods were used on the same building.

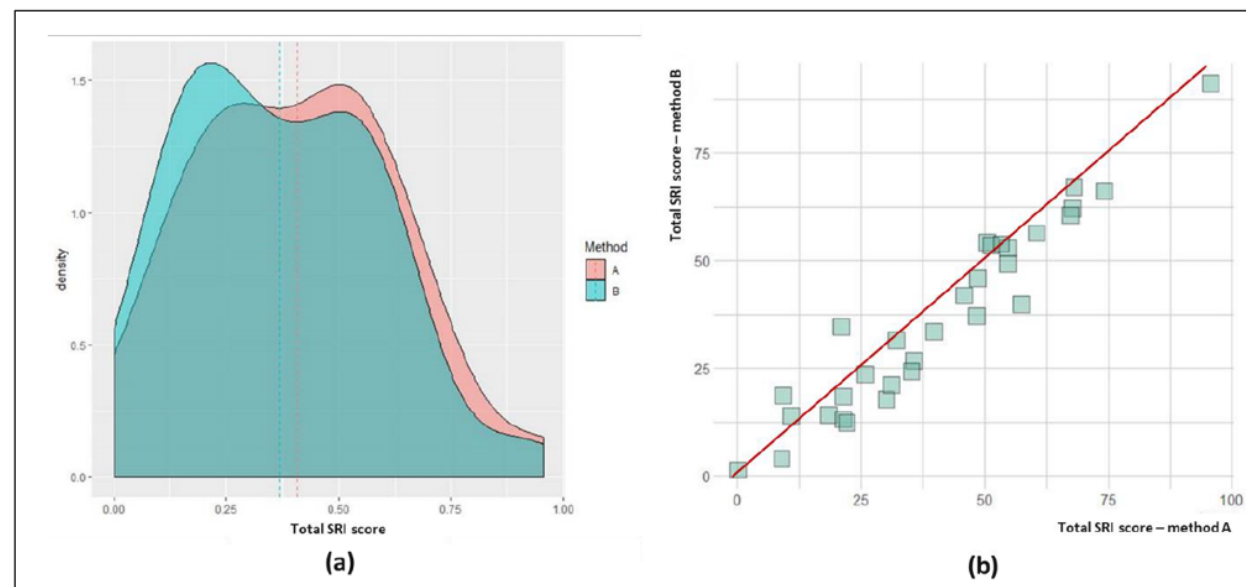
As described previously, the generic SRI assessment tool offers the option of two assessment methods: Method A (a simplified method) and Method B (a detailed method). The simplified method is intended to be used primarily in existing residential and small non-residential buildings of low complexity. While the detailed method is intended to be used primarily for non-residential buildings of a higher complexity and for new buildings. Both methods use the same assessment methodology and the generic service catalogue – the primary difference is that the detailed method includes a more comprehensive set of services in the catalogue. Key distinctions are summarised in the image below. From this the following insights were derived.

Method A (simplified)	Method B (detailed)
<ul style="list-style-type: none"> ● Simplified service catalogue ● Typically for existing residential buildings or small non-residential buildings (low complexity) ● Check-list approach ● Assessment time < 1 hour ● Self-assessment possible 	<ul style="list-style-type: none"> ● Full, detailed service catalogue ● Typically for new buildings and non-residential buildings (higher complexity) ● On-site inspection / walk-through needed ● Assessment time < 1 day ● Necessary involvement of an expert, with support from a facility manager
<ul style="list-style-type: none"> ● The assessment process is the same for both methods ● The service catalogue is different, which means the level of expertise required to conduct the assessment is different 	

While the detailed method B includes more services and hence is more comprehensive than the simplified method A the results of beta testing both methods with the set of 31 buildings found that the overall SRI score results were quite consistent across the two methods (see the figure below).

- Within a previous study, 31 buildings were assessed with both the simplified method A and the more detailed method B

- It was concluded that the results for both methods A and B were generally well-aligned



Comparison of methods A and B, applied to the same buildings during the public beta test

Figure 7. Comparison of SRI scores under Method A and Method B for 31 buildings

What is noteworthy from this figure is that the Method A skewed the SRI scores to slightly higher values but after this shift is accounted for exactly the same trends were observed (i.e. if a building had a relatively low SRI score under Method A it did under Method B, or conversely a relatively high SRI score under Method A would also result in a relatively high score under Method B). This suggests that while Method A is less comprehensive and much faster to conduct that it is capturing the most important SRI aspects and hence does not lose a significant amount of information in most cases. However, caution should be exercised before firmly drawing this conclusion as the comparative dataset was quite small (31 buildings) and it may be that much greater disparities arise for buildings with different arrays of TBSs. For the former issue it is to be hoped that more comparative data may become available through the MS test phases (although thus far few MS appear to have focused on Method A in their test phases). For the latter point it is likely that greater disparities will be found for buildings using less common TBS solutions as Method A tends to sacrifice some options for speed.

7 Freedoms MS have to adapt the methodology

This chapter sets out the freedoms that Member States have to adapt the SRI methodology while respecting the legal framework of the SRI as set out in the delegated and implementing regulations.

7.1 Definition of smart-ready catalogues

Annex VI of the SRI Delegated Regulation⁶ stipulates that for national implementation of the SRI Member States will need to establish a national catalogue of smart ready services.

The specific text is as follows:

1. *For the purpose of calculating smart readiness scores in accordance with the methodology set out in Annex I, Member States make available at least one smartready catalogue to be used by experts as the basis for identifying and assessing smart-ready services.*
2. *A smart-ready service catalogue includes the list of smart-ready services to be considered for calculating the smart readiness score, related functionality levels, and corresponding individual scores for the impact criteria.*
3. *The definition and any subsequent update of smart-ready catalogues reflect the current state of the art of smart-ready technologies.*
4. *Member States are encouraged to provide guidelines to experts on the most effective way to identify and assess smart-ready services using, where available, relevant Union guidance.*
5. *Member States may decide to make available several smart-ready catalogues, for instance for different building types.*

Thus, while Member States are charged with preparing the service catalogue this is only a requirement once they formally implement the SRI i.e. it does not apply during test phases. Furthermore, the smartready service catalogue must abide by the methodology set out in Annex I.

As explained previously, the Commission Services have already developed a generic EU smart readiness assessment catalogue which is aligned with the methodology set out in the delegated regulation. This allows two methodologies (as discussed in sections 3 to 6):

- **Method A** – a simplified methodology
- **Method B** – a detailed methodology.

The Commission Services have made available a generic Excel service catalogue I¹⁶ that implements these two methods. The latest version (version 4.5)¹⁷ abides by these methods but also allows Member States to add additional smart services should they wish to (extra rows are made available for each technical domain where the additional services can be added by Member States).

It is important for Member States considering adding such services to be aware if the following:

- the current set of smart services, as used in Method A or B, was arrived at after a very extensive pan-EU consultation and was designed to strike the best balance between completeness (i.e. where all potential smartready services would be included and recognised in the SRI) and workability (which takes account of assessment effort and feasibility)¹⁸

¹⁶ Which can be requested by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package> – see also https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/sri-implementation-tools_en

¹⁷ The SRI framework Excel tool, can be requested as part of *the SRI assessment package* which is available upon request by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.

¹⁸ The details of this generic catalogue and how it was initially created are set out in the 2nd technical assistance study¹⁴. As mentioned above, an updated version, known as the SRI framework Excel tool, can be requested as

- It aims to strike an appropriate balance between these two opposing concerns while respecting the focus of the three broad pillars for the SRI set out in the EPBD and maximizing the value of the SRI (as a user information tool and change agent) per effort expended to conduct an assessment
- In so doing over 100 smart services within the remit of the EPBD were screened and those with the most impact were retained
- Appraising prospective additional smartready services is not a simple matter and hence significant effort should be foreseen in potentially developing new ones
- If the SRI is viewed as a change agent tool it is important to understand that it can work both as an end user information tool but also as a common platform to develop, categorise and promote smartready services across the Single Market – technology providers are potentially important promoters of smartready services and are likely to make use of the SRI functionality in their service offers and promotions providing there is commonality of approach across a large enough market (this aspect favours having a common approach across the Single Market)
- Conversely, there may be some opportunities for smartready services that make more sense in a specific Member State than in the EU as a whole -for example, those that could be related to the preponderance of a specific service such as district heating, or specific demand response opportunities etc. and this may favour the development of additional smart ready services
- Very importantly, it should also be noted that as the SRI is developed within the auspices of the EPBD it is bound by the jurisdictional scope of the EPBD. There are several important areas outside this scope where building smart services are already available but are not included within the SRI - e.g. for safety (fire etc.), security (controlled access, site monitoring), entertainment and aesthetics. As it may be challenging to explain to end users why these are not included in a building smart readiness scheme it could be apposite to consider adding some; however, doing so would require considerable development work and would imply additional impacts and domains than set out in the common methodology. Thus, these would depart from the SRI definition as set out in the Delegated Regulation and hence could necessitate being treated as an add-on that is distinct from the common SRI scheme and rating per se
- Within the generic SRI service catalogue every time a new service is added in a given technical domain its effect will be to dilute the contribution that each of the other smartready services make to the overall impact scores for the domain. Thus, including new services will result in SRI scores that are not directly comparable to those seen elsewhere. One option to address this could be to report SRI scores under both the default common EU scheme (Method A or B) and also under the local scheme with the additional services. This would enable comparability where that is useful, but also inclusion and recognition of the additional services deemed relevant at the local level.
- Practically, factors that affect decisions about the smart services to include may only become apparent in the light of the findings from a national test phase.
- In principal, MS may also:
 - adjust the weighting factors (except those that aggregate the seven overall impact scores to the three pillars and overall SRI score) – this is discussed in section 7.3
 - adjust the scores attributed to specific smart services functionality levels (this is the reason why the scores are shown in detail in sections 4 and 5 and also why their contribution to each technical domain's aggregate impact scores is shown – i.e. to provide full transparency so MS can consider whether there is any need to adjust these within their own national implementation)
 - add new functionality levels or adjust the existing ones
 - set criteria for the relevance of specific smart services (these could be conditional e.g. in the event that a building has a single heat generator with a hydronic heating distribution and emission system

part of the *SRI assessment package* which is available upon request by using this form:
<https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.

then ignore (weight to zero) smart services X/Y/Z etc.), or in the event that a building has no parking spaces ignore (weight to zero) the EV charging technical domain, etc.

- Again, it is to allow consideration of all of these aspects that the Method A and B have been itemized in full detail in sections 4 and 5; however, the same considerations will apply as previously mentioned i.e.:
 - Changing scoring will make the local results incomparable with those applied elsewhere unless scores are reported under both the local and common EU systems
 - Adjusting smart service functionality levels away from those applied in Methods A and B will dilute the ability of service providers to provide and market their products under a common process across the Single Market and will weaken the value proposition for them to engage which increases the likelihood of lower promotion and uptake but also weakens the rationale to invest in a standard product platform and thereby risks slowing down technology learning curves which are an important means of reducing technology costs
 - Adding extra (higher functionality levels would also weaken pan-European comparison (as SRI scores would shift downward for the extant functionality levels but data could be processed both ways to allow comparable scores to be provided
 - Adjusting weightings would also make overall SRI scores incomparable (unless both scores from the local and common EU system were reported) but does not affect the business model of smart service providers to (anything like) the same extent as adjusting the functionality levels would do.

7.2 Usage of Smart Readiness Assessment Catalogues

Once a Member State launches a formal SRI scheme they are required to use their own formal SRI assessment catalogues. Thus, the SRI framework Excel calculation tool provided by the Commission Services cannot be used for any formal assessment, as clearly stipulated in the terms and conditions ("Using this SRI calculation tool can by no means lead to any claims on an actual score or certificate for a building").

This means that Member States seeking to issue formal SRI certificates need to establish their own formal calculation tools for use once the full scheme is initiated. This condition only applies for the issuance of formal certificates and does not apply during SRI test phases.

Although, Member States need to issue their own formal assessment catalogues (with any related assessment tools) these can be fully aligned with the SRI framework Excel tool should they wish. For the reasons alluded to in section 7.1. it is generally preferable that these should be, to the maximum extent possible, once any necessary and permitted local adaptation factors have been taken into account.

7.3 Application and definition of weighting factors

As previously explained the overall SRI score, the three key functionality scores and the overall impact criteria scores are derived from the matrix of technical domain and impact criteria scores. A priori, it is logical for the contribution of each technical domain to the specific overall impact scores to vary depending on the importance of each domain to the impact in question. Therefore, it is necessary to apply weighting factors when creating the overall summed average score for each impact criterion.

In principle it is possible to derive weightings that are averaged for the EU as a whole, while noting that the appropriateness of weightings will be dependent on the context. An obvious example, is that most buildings operating in cold climates will not need space cooling and hence space cooling could be weighted at zero (unless it is present in a building in which case its weighting could still be low but not zero). In recognition of this the SRI smart services catalogue issued by the Commission Services defines five default climate zones.

Depending on the climate zone selected the energy impact weighting given to a smart service is adjusted at the technical domain level to better reflect the expected contribution it will make to the building's energy balance. However, while these defaults are better than a single common value they also don't reflect actual local variations in climate within specific Member States. For example, coastal areas are likely to have quite different climates to mountainous areas and this could constitute a rational basis for Member States to set their own

weighting values that apply within specific sub-Member State geographies. Note, another rational option would be to link the choice of weightings to the relative importance of each domain in the energy balance data within in an EPC – however, that presumes EPC assessment data is available and that the SRI assessment has access to it.

Aside from climate, Member States may wish to consider potentially adjusting the SRI calculation tool weightings to reflect the specific context of their building stock.

The current version of the SRI calculation tool encourages users to set the building type from the following options:

- **Residential**
- **Non-residential.**

It also allows the building usage (purpose) to be selected from the following options for residential buildings:

- **Single family house**
- **Small multi-family house: 10 residential units or less**
- **Large multi-family house: more than 10 residential units**
- **Other: student housing, care homes, etc.**

And in the case of a non-residential buildings for the following options to be selected:

- **Offices**
- **Educational buildings**
- **Healthcare**
- **Other**

It proposes that the selected building type and usage will be used to determine the appropriate weighting factors, which can, for example, reflect the differences in relative importance of domains such as domestic hot water or cooling depending on the use of the building. However, in the current version, no differentiation has been made in the default weighting factors within the primary building type use sectors. In other words, all non-residential buildings currently use the same weighting factors, regardless of their building usage. Similarly, all residential buildings currently use the same weighting factors. Nonetheless, the calculation spreadsheet has the option to define custom weighting factors. Therefore, Member States may either wish to use the default weighting factors, or to conduct further work to define their own set of weighting factors for any key domains and impacts that are likely to be regionally/locationally sensitive.

7.4 Possible adaptations

The use of the common SRI methodology developed at EU level is recommended, as it already considers local specificities (for instance, different climate zones are embedded within it), and it has been designed following extensive Europe-wide stakeholder consultations. However, as the smart building sector is evolving at a fast pace, elements of the common SRI methodology may be adapted to reflect local contexts and/or technological evolutions. Part of the rationale for a common EU methodology was elaborated in the 2nd technical assistance study¹⁴ which determined that the impact of the SRI would be dependent on the combined “push” and “pull” effects that it offers. The “pull” effect is the demand for SRI certification and the impact such certification subsequently has on demand for smart services, while the “push” effect is the willingness of technical system providers to adapt their product service offers to align with the SRI functionalities and to promote them accordingly. It is important to keep in mind that the “push” effect will be much greater if there is harmonisation across the Single Market as service providers can invest in a common set of functionalities and promote them accordingly across the entire European market in a consistent manner and thereby benefit from economies of scale.

The choice between regular methods (A or B) will be informed by the perspective of the Member State undertaking the SRI test or implementation phase and how they view the value of the choice in response to their country's specificities.

In addition, the generic methodology also includes a triage process which identifies the relevant services for a specific building and adapts the methodology to the characteristics of the building. Specifically, this triage recognises that some smart services may be not be relevant for a particular building. For example, services on controlling a heat pump, when no heat pump is present; or services on electrical vehicle chargers when there are no parking spots available. The triage process allows such services to not be taken into account in the calculation. Equally, smart services can be considered relevant because they should be present (from a policy perspective). As an example: even if there is no battery storage available, the potential impacts can be taken into account when defining the maximum obtainable score.

Utilisation of a customised method is also permitted. In this case:

- the applicable services are chosen one by one in the existing service catalogue
- additional services may be defined within each technical domain.

It is a decision of Member States as to whether they will adopt such adaptations; however, to the extent possible the easySRI calculation engine and wizard tools need to be designed to accommodate all possible choices that Member States may opt to make.

8 Implementation within the easySRI calculation tool

The previous sections have described the extant SRI legal framework, the current Method A and B default common EU service catalogues, the options Member States may wish to apply and the implications of doing so. This section provides a summary of the implications of these for the development of the easySRI calculation tool.

In summary, the easySRI calculation tool will need to be capable of:

- Providing any SRI assessment methodology that respects the requirements set out in the delegated regulation as reprised in section 3
- Calculating the SRI in accordance with the EU common methodologies, which are currently Method A and B in service catalogue v4.5 as set out in detail in sections 5 and 4 respectively
- Calculating SRI scores in line with any Member State-specific methodology that respects the requirements in the delegated regulation
- Calculating and reporting all the SRI results required under the delegated regulation
- Providing all required calculational results needed to issue SRI certificates
- Receiving assessment data loaded via the easySRI wizard tool

In practice, this means that it needs to align to Methods A or B by default but allow potential MS-specific adaptations with regard to:

- Weightings
- The inclusion or exclusion of smart services i.e. potentially cutting back or adding smart services compared to the common Methods A and B – note, if a smart service present in one of the common Methods is to be excluded it can simply be weighted to zero; however, if a smart service is to be added then a MS will need to define the overall service and each of its specific functionality levels and then to ascribe functionality level dependent scores for each of the seven impact criteria
- adjusting the impact scores attributed per smart service functionality level
- adjusting the functionality levels ascribed to any smart service and potentially also adjusting the impact scores attributed to them

Ideally, the easySRI calculation tool would allow the computation of a building's SRI score under either Method A, Method B or a Member State specific adaptation of the SRI in such a way that the score could be reported for each of these if sufficient data is entered to do so.

9 Assessment

The SRI assessment process can be broken down into the following steps

- **Collection of information on buildings and systems** for the assessment of smart readiness, including but not limited to on-site inspections (section 9.1)
- **Means of collection of additional information** about building connectivity, system interoperability and cybersecurity in the scope of the assessment of smart readiness (section 9.2)
- **Means of dealing with changes in the calculation method** over time (e.g. through indicating a validity date or a version no.) (section 9.3).

The text in this section draws directly upon that provided in the report Provisional Guidance on the Implementation of the SRI¹⁹ written by Paul Waide of WSEE (lead author of the current Task 3.1 report) and is reprised here to familiarise the easySRI project team with the issues it covers on SRI assessment.

9.1 Collection of information on buildings and systems

As set out in the delegated regulation, the SRI requires application of an on-site assessment method in order to collect the information on a building and its technical domains needed to complete an SRI assessment. This information will be input by the assessor into the SRI calculation tool used in the Member State.

Visual inspection methods are applicable for collecting the required data and can be applied with checklists and suitable calculation tools (e.g. a calculation tool provided online or on a portable IT device). In principle, anything that can be inspected on-site can also be inspected off-site if the appropriate photographic/video evidence is provided, so in theory off-site inspection could also be used; however, on-site assessment carries less risk of something important not being seen providing the formal SRI assessor can access the appropriate parts of the site and also ensures that the evidence is indeed from the site being assessed. It also mitigates the risk of the supplied visual evidence not being comprehensive enough e.g. perhaps due to misunderstanding by the person on-site supplying the visual evidence.

When conducting an assessment an assessor will need to view all the pertinent technical domains and will often also need to inspect their technical documentation. For larger buildings it will frequently be more efficient to liaise with the facility manager who will be able to direct the inspector to the relevant places and supply relevant information to permit an effective assessment to take place. In order to support quality control of the assessments it will be important that assessors are required to either supply evidence to support their assessment (such as photographic evidence) or a Declaration of Honour, or both.

When assembling and assessing the evidence needed to conduct the SRI assessment having access to the following sources of information (where relevant) may also facilitate the assessment process:

- supporting calculation files, e.g. input/output data sheets from permitted energy performance assessment tools in a standardised format
- product data sheets
- checklists produced via other assessment processes (e.g. heating and cooling inspections) and any related Declarations of Honour
- supporting video and photographic evidence

¹⁹ *Provisional Guidance on the Implementation of the SRI*, Paul Waide et al, 2021; <https://circabc.europa.eu/ui/group/54384127-eb1d-445e-9b6e-ef5ef14fe429/library/0666bbb4-b88a-4063-b55e-82faf62fa738/details>

- real-time performance data.

This evidence can be used to support and clarify the technical domain functionality assessments.

If online processes are set up through an assessment registration tool and database then it would facilitate any subsequent quality control verification actions and would be likely to considerably increase the quality of assessments achieved. This is because assessors would be more aware of the possibility that their assessments could be checked. With the implementation of an online registration system for all SRI assessments then many checks could be automated to systematically identify cases where:

- standardised data submissions and assessment files are incomplete
- reported values are inconsistent.

On the other hand, the establishment of automated data submission and processing systems would need to be done in way that adequately addresses data privacy and cybersecurity risks and hence would require careful implementation to respect the rights of building owners and contractors.

9.2 Collection of additional information

The SRI delegated regulation^{2,3} provides options to include additional information about connectivity, interoperability and cybersecurity on the SRI certificate.

Specifically, points (k) and (l) in Annex IX state:

The information contained in the smart readiness indicator and conveyed to the end user includes the following:

k) where possible, available information on connectivity, in particular on the existence of high-speed-ready in-building physical infrastructure, such as the voluntary 'broadband ready' label,

l) where possible, available information on interoperability, cybersecurity of systems and data protection, including where relevant on conformity to commonly agreed standards, and information on related risks

The potential means of collecting information on the status of these for a building under SRI assessment is now discussed for each aspect in turn.

9.2.1 Building connectivity

The delegated regulation^{2,3} stipulates that where possible, available information on connectivity, in particular on the existence of high-speed-ready in-building physical infrastructure, such as the voluntary 'broadband ready' label²⁰ should be included in the SRI certificate.

As building connectivity is a necessary precursor to many smart ready technologies (SRTs) the "broadband ready" label is also relevant to the SRI with regard to how ready the building is to apply such technologies and the services they offer. Furthermore, the implementation process has several parallels with the SRI's in that the scheme is initiated through an EU Directive but is voluntary for EU Member States and entails an inspection process to determine compliance with the nationally adopted specifications. In principle, where such schemes exist they could potentially be implemented in common with the SRI to share assessment costs and improve the net value proposition of both schemes, albeit that while the focus of both schemes overlap they are not the same.

²⁰ The 2014 Broadband Cost Reduction Directive 2014/61/EU contains a provision that Member States may (voluntarily) provide a "broadband-ready label" for buildings which have been equipped with high-speed-ready in-building physical infrastructure where 'High-speed-ready in-building physical infrastructure' means in-building physical infrastructure intended to host elements or enable delivery of high-speed electronic communications networks.

Installing physical infrastructure that enables high-speed internet access is more cost-effective and less disturbing for residents if done at the time of construction or implementation of major renovation. If buildings are equipped with the necessary infrastructure, companies can install cables or other active equipment more quickly and at significantly lower costs, allowing them to offer their services faster and to more citizens. With this thought in mind, Articles 8 and 9 of the Directive on “Measures to reduce the cost of deploying high-speed electronic communications networks”²¹ ensure high-speed-ready, accessible in-building physical infrastructure in all newly constructed and majorly renovated buildings.

To achieve this objective, the buildings for which permits are submitted after 31 December 2016 must be equipped with physical infrastructure, such as mini-ducts capable of hosting high-speed networks, and an easily accessible access point for the providers of public communications networks who wish to terminate their networks at the premises of the subscriber. Such buildings shall be eligible to receive the voluntary “broadband-ready” label in Member States where this is available.

RECOMMENDATION: Thus, it is recommended that at least all buildings that comply with this provision e.g. those who have received permits from 2017 onwards and any others that can demonstrate compliance should be recognised as being “broadband ready” on the SRI certificate.

9.2.2 System interoperability

The delegated regulation^{2,3} for the SRI specifies that where possible, available information on interoperability including where relevant on conformity to commonly agreed standards can be presented on the certificate.

The degree of interoperability of technical systems can be a limiting factor affecting the smart services and impacts that can be delivered within a building. Interoperability of systems can avoid duplication of efforts (e.g. investment for occupancy detection systems and monitoring displays for lighting, for space heating and cooling and ventilation systems) and optimise the control and maintenance of technical domains (e.g. a single interface for controlling heating and cooling facilitates the operation of the building and prevents energy wastage through uncoordinated simultaneous heating and cooling in building zones). Next, interoperability is essential to allow technical domains to interact with energy grids. Finally, interoperable systems are desirable in the light of future upgrades of the building as they can avoid proprietary lock-in and facilitate innovative solutions. Thus, for all these reasons interoperability is a highly relevant factor that affects a building’s smart readiness.

The various levels of interoperability (technical, syntactical & semantic) complicate the definition and assessment of interoperability aspects.

In the generic SRI methodology expressed in Methods A or B, the smart readiness of a building or building unit is determined on the basis of the assessment of smart ready services (and their functionality level) present in a building. This reflects the capabilities of the building or building unit to adapt its operation to the needs of the occupants and the grid, and to improve its energy efficiency and overall performance. Apart from these key capabilities, there are some cross-cutting issues related to the greater uptake of smart technologies, including interoperability of the technical buildings systems. The SRI could potentially play a role in informing the market actors on this important aspect and even assist in shaping the market.

Various ways to do so can be considered, e.g. blending the assessment in the core SRI calculation methodology, using the SRI as a means to disseminate additional information, or supplementing the SRI assessment with additional evaluations of these aspects besides the overall SRI score. In the 2nd technical assistance study¹⁴, three potential approaches to consider interoperability within the SRI were presented, each with different implications towards SRI calculation methodology and assessment process:

²¹ Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks Text with EEA relevance <https://eur-lex.europa.eu/legal-content/en/ALL/?uri=celex:32014L0061>

- **Implicit approach:** Define services that require interoperability, without defining the required standards or protocols needed to enable such interoperability. For example, if a service for "avoiding simultaneous heating and cooling" is present, implicitly these systems will inherently have to be interoperable (either directly or through other gateways)
- **Explicit approach:** take into account the level of interoperability of services (based on the standards and protocols featured by a given TBS) in the calculation of the SRI. A higher SRI score could be granted if systems adhere to a list of specific standards and protocols
- **Informative approach:** Provide information of the level of interoperability of services (based on the standards and protocols featured by a given TBS), for instance, in the SRI and accompanying documents. A structured overview of such information provides a valuable source for building owners when planning to upgrade their building systems.

For pragmatic reasons a formal evaluation of interoperability in a manner which affects the SRI scoring process (i.e. the explicit approach) is not currently included as part of the generic SRI scoring system. The reasons for this were explained in detail in the 2nd SRI technical assistance study¹⁴ (page 88) and are summarised as follows:

- Whilst interoperability is acknowledged as a very important concern in relation to the SRI, there are significant limitations to the actionability of the explicit evaluation of interoperability
- It would require in-depth information on a very broad range of technology and implementation routes by numerous vendors - this information is usually not readily available to an assessor and would require additional investigations
- Especially in the case of legacy equipment it might be very hard or even impossible to retrieve sufficiently detailed information
- Such an assessment would need to be performed for many of the technical domains present in a building (heating, cooling, lighting, ventilation, building management systems (BMS), etc.), which would require a substantial amount of time and effort and thus have important repercussions on the cost of an SRI assessment.

Instead, the generic SRI methodology takes into account interoperability as follows:

- Implicitly, interoperability is evaluated as part of the generic SRI assessment: a few services explicitly require interoperability in order to achieve higher functionality levels (some services such as MC-S1 and MC-S3 are specifically introduced that support this goal)
- Additionally, information of interoperability aspects can be optionally added to the SRI certificate whenever it is available. This information does not affect the SRI score in itself.

Some schemes, such as that operated by the Smart Building Alliance²² in France, do entail explicit assessments of building interoperability and when such information is available and produced by a credible and recognised source Member States could opt to include it within the information provided on the certificate. Member States who are considering this type of explicit interoperability assessment within the SRI are advised to appraise how this has been implemented in schemes such that operated by the Smart Building Alliance.

In principle, Member States may also wish to consider establishing their own system of inspecting the use of open protocols as a criterion in the assessment of interoperability aspects and reporting the findings on the certificate. This could be relevant in all of the three potential approaches set out previously. However, when considering this Member States should be aware that there are some concerns towards establishing a practical assessment procedure:

- Using open standards can ease interoperability but this is not a synonym for interoperability because many open standards are not mutually interoperable. Nevertheless, their openness allows for

²² <https://www.smartbuildingsalliance.org/>

gateways to be established which facilitate communication between two distinct protocols; a practice which is very common in the current market. From this perspective, the use of open protocols does not guarantee interoperability, but it would create a form of “readiness” to allow interoperability now or in the future

- For a practical assessment, the standards and protocols need to be well documented, e.g. in technical product sheets or labels. In the SRI calculation methodology, an evaluation would ideally be performed on the level of smart ready services or domains. In practice, most services and domains of the suggested SRI service catalogue require a smooth collaboration of a multitude of products (e.g. thermostats, pumps, valves, heat generators, etc.). The assessment of the use of open protocols therefore requires the inspection of a great variety of technical products. In principle, such assessment could be supported by the introduction of labels or codes on equipment, structured product databases or a means for TBS to self-report the standards and protocols which are supported.
- If this approach were to be pursued, a well-supported list of open standards will need to be defined. A first version of such a list was drafted under the 2nd SRI technical assistance study¹⁴ and contains the following protocols: 1-wire, BACnet, DALI, DMX, EnOcean, KNX, Lonworks, Modbus, M-bus, TCP/IP, X10, ZigBee, Z-Wave. In addition, some stakeholder(s) suggested including SAREF and Spine (which are ontologies rather than protocols) and DECT/ULE. If the approach of using open standards and protocols is to be pursued, further actions would need to be taken to ensure a broad consensus on the list of standards and protocols to be included.

Interoperability is a fast-moving field, and many software and hardware solutions emerge which allow interoperability despite using different technologies and protocols, for example a DALI-to-KNX gateway to integrate lighting and KNX control. In conclusion, adoption of such an approach would require further efforts to generate a broad consensus on standards and protocols that would be accepted or the development of other definitions and a calculation method to explicitly rate interoperability scores.

RECOMMENDATION: For more information on interoperability and how to consider its inclusion within building certificates, such as the SRI, it is recommended to read the SmartBuilt4EU Task Force publication on interoperability available at <https://smartbuilt4eu.eu/publications/>. In addition, the interoperability of BACS (upon whose functionality much of the SRI relies) is discussed extensively in the Ecodesign Preparatory study for Building Automation and Controls²³.

9.2.3 Cybersecurity

The delegated regulation^{2,3} for the SRI specifies that available information on cybersecurity including where relevant on conformity to commonly agreed standards, and information on related risks can be presented on the certificate.

Cybersecurity is highly relevant to the SRI in terms of data protection and ensuring no action associated with the SRI is responsible for compromising cybersecurity. As the SRI concerns smart technologies which are likely to be connected and hence potentially exploitable through cyberattacks the SRI's implementation needs to be mindful of these risks and take all reasonable steps to minimise them. The European Cybersecurity Certification framework²⁴ is thus potentially an initiative that could help to minimise such risks to the extent that it develops criteria that are applied to smart ready technologies (SRTs) and enables cybersecurity status to be communicated to market actors.

²³ https://energy.ec.europa.eu/studies/preparatory-studies/ecodesign-preparatory-study-building-automation-and-control-systems_en#documents

²⁴ The EU cybersecurity certification framework for ICT products enables the creation of tailored and risk-based EU certification schemes. <https://digital-strategy.ec.europa.eu/en/policies/cybersecurity-certification-framework>

At the current time this scheme is still quite new and cybersecurity certification requirements and regulations are under development according to a working plan. Development work is being conducted by ENISA²⁵.

Under this framework the Commission announced a set of measures to strengthen the cybersecurity of wireless devices and products in October 2020. The proposed legislation establishes obligations for manufacturers to increase the level of cybersecurity of products placed on the EU market. These obligations are for the benefit of consumers. It will also allow the Member States to take corrective measures in case unsecure products are found on the market. The Commission's initiative aims to achieve the following objectives:

- Make networks more resilient: The equipment will have to incorporate features to avoid their misuse to harm communication networks.
- Improve the protection of personal data and consumers' privacy: The equipment will incorporate features to guarantee the protection of personal data and privacy.
- Reduce the risk of monetary fraud: The equipment will have to include features to minimise the risk of fraud when the equipment is used to make electronic payments.

The initiative notes that wireless equipment is the target of more than 80% of cybersecurity attacks, compared to wired devices. Accordingly, it covers certain categories of wireless devices that use radio technology. The decision on which devices are covered has been taken on a risk-based approach and according to the results of a cost-benefit analysis. In particular, the legislation is applicable to the following equipment (amongst others): Devices capable of communicating via the Internet: Examples of such equipment include electronic devices such as smartphones, tablets, electronic cameras; telecommunication equipment as well as equipment that constitutes the 'internet of things'. Due to insufficient security, such devices present a risk that third parties can improperly access and share personal data, including for fraud purposes, or that such equipment is misused to harm the network.

Many SRTs are capable of communicating with the internet and thus will become subject to the requirements of this initiative.

To implement this measure the Commission has adopted a delegated act under the Radio Equipment Directive (2014/53/EU)²⁶. The co-legislators empowered it to determine certain essential requirements with respect to specific classes and categories of radio equipment.

The delegated act imposes essential requirements, formulated in general terms as objectives to be achieved, that are deemed necessary for ensuring an adequate level of cybersecurity, personal data protection and privacy. The manufacturers will have the possibility to choose the specific technical solutions for the implementation of these objectives.

The Commission have launched a standardisation request to the European Standardisation Organisations in order to develop harmonised standards in support of this piece of legislation. The standards will be developed with the participation of industry and will be assessed by the Commission against the essential requirements laid down by the EU legal framework. Once it has been established that the specific technical solutions described in these standards comply with the applicable legal requirements, these standards can provide a presumption of conformity with the delegated act. Concretely, this would imply that to benefit from a presumption that their product complies with the applicable legal requirements, manufacturers have to adopt a given technical solution described in a harmonised standard.

Under the terms of the delegated act all wireless products with relevance to SRTs that are placed on the market will be required to be cybersecure from the summer of 2023 onward. Member States will thus have the option of adapting SRI assessments to determine whether wireless devices providing smart capabilities in the building stock being assessed are in compliance with this regulation and reporting this in the SRI certificate, or

²⁵ The European Union Agency for Cybersecurity (ENISA) <https://www.enisa.europa.eu/>

²⁶ https://ec.europa.eu/growth/system/files/2021-10/C_2021_7672_F1_COMMISSION_DELEGATED_REGULATION_EN_V10_P1_1428769.PDF

potentially simply using the certificate to inform users of the importance of cybersecurity and of initiatives to enhance such security.

In addition, or alternatively, Member State specific cybersecurity initiatives may already be operational and can provide a basis for information to be supplied on the certificate.

10 Issuance of certificates, parties involved and registration

This section sets out a high-level analysis of the different options regarding the issuance of SRI certificates; the relation between the different stakeholders and the communication flow between them; as well as the information to include in the SRI certificate; and how that information is obtained. It is also important, and it is part of the scope of this sub-task's scope, to address how the certificates' register is to be managed, and what entity will oversee its storage and maintenance. This has been done by identifying scenarios and alternatives for each aspect related to the SRI certificate.

To do so, the sub-task has been divided in the following sections:

a. DIFFERENT OPTIONS OF STAKE HOLDERS RESPONSABILITIES IN THE ISSUANCE OF THE CERTIFICATE.

Firstly, a thorough analysis has been carried out to identify the different stakeholders concerned in the process of obtaining data for the analysis and SRI rating of buildings; and how the communication flow is done between them. The responsibilities of each of these stakeholders in the issuance of certificates are identified. The identified stakeholders are those that, in each country, participate in any way in the design process, building, maintenance and functioning of buildings; without forgetting utility companies and energy management companies. For each role, a brief description of their prospective responsibilities regarding the issuance of the SRI certificate process has been given; analysing each option's pros and cons.

As a result of this analysis, the following conclusions have been reached:

Once the responsibilities of the different stakeholders concerned in the process and the advantages and disadvantages associated to carrying out the building's SRI rating have been analysed, it is concluded that it is necessary to dismiss all the options that do not generate sufficient trust and credibility among its recipients.

Additionally, the rating process of similar certificates (EPC) for which certain security and credibility assurances are needed (both in the process of obtaining data and in determining the obtained rating) has been analysed, and a similar option has been chosen.

Based on this analysis, and with the sole purpose of assuring a reliable certificate issuance process, it has been considered that the SRI certificate issuance process should be as follows:

- ✓ The obtention of the necessary data for the issuance of the certificate must be conducted by a qualified technician, who will have needed to receive the required training to know the systems and devices that take part in the SRI certification process, and how those systems and devices work. Each country will have to choose the technicians' assessment process, just as happens currently with regard to the issuance of EPC certificates.
- ✓ There are different parties involved in the process of obtaining the data needed for the derivation of an SRI rating, and some of these parties are fundamental when understanding the characteristics of the building's control and monitoring devices. Moreover, another peculiarity is that these agents are not the same in every country.

Based on this, it is the different stakeholders' responsibility to provide the SRI certifier with the necessary data to issue the certificate (data concerning the characteristics of the building's control

and regulation devices and systems involved in the process of issuance of the certificate; as well as their operating conditions).

- ✓ It is the certifying technician's responsibility to analyse the data received and to carry out the required onsite inspection to verify the veracity of the data provided by the parties involved. With the data thus obtained, the certifying technician will have to issue the SRI rating report.

b. INFORMATION AND DATA THAT MAY BE NEEDED.

Aside from the, the information and data that may be needed for the issuance of the certificate is also studied in Task 3.1. This task provides a detailed analysis of whose responsibility it would be to supply information for the certification process, considering the possibility of obtaining data automatically from a BIM model. To do so, creating a specific procedure concerning the modelling and parametrization criteria of projects would be necessary. It also studies the different options for obtaining information concerning the building, wherein the building's logbook is of great importance, as well as the minimum required information. The pros and cons of different data sources are also analysed.

As a result of this analysis, the following conclusions have been reached:

- ✓ **New Buildings:** In the case of new buildings, most of the required information will be available directly on the project's documentation and, in the case of buildings having a BIM model, or even DIGITAL TWINS, this information will be available there too. To do so, a protocol to obtain that information will need to be elaborated. This protocol is to be developed by each country, in accordance with the parties involved in the data collection process.
- ✓ **Existing buildings:** In the case of existing buildings, the information will be provided by the stakeholder that the ownership determines, but, in any case, the party in charge of the Facility will have to be involved, as it is the party involved that knows how the building's systems involved in the SRI certification work best. Additionally, in the case of existing buildings, the information on the Building's Logbook, with the purpose of contrasting the information provided by the stakeholders. Although, in most cases, this information will not be too relevant (systems may have been updated and these updates may not have been registered on the Building's Logbook, or they may even have been left out of service).

In any case, it is the certifying technician's responsibility to determine the information they need to issue the building's SRI rating, and to guarantee that the information used to issue the certificate is complete and truthful.

c. DIFFERENT OPTIONS OF STAKEHOLDER COMMUNICATION FLOWS.

In addition to the above, various different options of stakeholder communication flows have been analysed. These include options regarding who should communicate what and to whom, and the advantages and disadvantages of different communication flows.

As a result of this analysis, the following conclusions have been reached:

- ✓ Firstly, it is the building's owner who is responsible for providing the necessary information to issue the SRI certificate. Additionally, the owner will appoint the different stakeholders involved in the process. It is essential that, in the case of existing buildings, the party in charge of the building's Facility management takes part in the communication process.
- ✓ It is the responsibility of the certifying technician to determine whether or not the information provided is sufficient, and if the parties involved appointed by the building's owner have the required knowledge about the building's control and information systems, as well as about their operating conditions. In any case, all of the information received will have to be checked onsite by the certifying technician.
- ✓ The certifying technician will be able to inquire, if needed, about technical information from the devices' manufacturers (WEB, technical datasheets...).

d. CERTIFICATE FORMAT OPTIONS.

Moreover, **the optimal format that the SRI certificate can have may depend on the kind of building** under assessment, as well as whether it would be adequate to create different formats depending on the climate zone or weather characteristics, is also studied. Two kinds of buildings have been considered:

1. **Residential buildings.** In this section two options are examined: a simpler and easier to obtain certificate, with less information, or a more complex one, containing more information. The pros and cons of each option is analysed.
2. **Remaining buildings.** A more detailed certificate is studied, containing information concerning the rating obtained regarding technical domains, impact criteria and key functionalities.

As a result of this analysis, the following conclusions have been reached:

- ✓ It has been considered that a single format must be issued, independently from the building's intended use and the climate zone it is in, as SRI ratings are independent of the weather. Nonetheless, the data appearing on residential buildings' certificates ought to be more easily interpreted by users, although they must have the same capacity of obtaining the same data as the other certificates from a .xml file.
- ✓ The issued format must be digital, as there have been found more advantages than disadvantages when compared to the physical format.

e. **CERTIFICATE ISSUANCE OPTIONS.**

Several **certificate issuance options** have been considered, and for each option a detailed list of pros and cons has been made. The options considered are:

- ✓ **Autocertification or first party certificate:** the owner of the building is the one to issue its own SRI certificate, based on the reference procedure.
- ✓ **Second party certificate:** the entity responsible for the creation of the certification procedure is the one that issues the corresponding SRI certificate. It relies on the reports concerning the state of the building sent by the technicians or entities accredited by the entity.
- ✓ **Third party certificate:** accredited entities can make reports concerning the state of the building and to issue the corresponding SRI certificate. These entities oversee the register.
- ✓ **Mixed certification system:** accredited entities or technicians can make a report concerning the state of the building and issue the corresponding SRI certificate, but either public administrations or the committee oversees the register.

As a result of this analysis, the following conclusions have been reached:

- ✓ The issuance of first-party certificates is dismissed due to the little credibility they would have.
- ✓ Concerning second-party certificates, they are dismissed also due to the complexity of the register creation process and to the high cost they would have, as the data collection, the certificate issuance process and the registration and custody of the certificate would be controlled by accreditation entities.
- ✓ Third-party certificates would be controlled by accredited enterprises that would be the ones in charge of obtaining the data and issuing the certificates; which would make the process more complex and expensive,
- ✓ A mixed certification system has been opted for, as it is enough to establish an accreditation procedure for technicians (each country will be able to choose which is the procedure that best fits its needs), and these technicians would be the ones in charge of issuing the SRI certificate.

In accordance with this, each country will establish the technician's certification process, with this procedure being similar to the already existing one for EPC certificates, which simplifies the process and shortens launch periods (they could be the same technicians that are currently issuing EPC certificates).

f. **CERTIFICATE REGISTRATION OPTIONS.**

The last part of this section studies different **certificate registration options**, detailing their advantages and disadvantages. Those options have been classified depending on what kind of entity is responsible for the register:

- ✓ **State agency** (public administration)
- ✓ **an SRI committee**
- ✓ **Certifying enterprises**

As a result of this analysis, the following conclusions have been reached:

- ✓ To simplify the process and to shorten launch periods, it is considered fit that the public administration will be the one to set-up the register for SRI certificates. These registers could, in most cases, be the same registers in which EPC certificates are currently being registered.

g. CERTIFICATES' UPDATE OPTIONS

It has been considered that the SRI update process ought to be like the corresponding process of EPC certificates every ten years maximum, and as long as the building undergoes any modification that may imply a change in the SRI rating.

10.1 Different options of stakeholders' responsibilities in the issuance of the certificate

The first activity was the identification of all the stakeholders that can play a role in the process of a SRI certification. An overview of potential roles is shown in Table 1. It is a simplified overview prepared with the aim to be as general as possible, but some roles might be different in every country.

Table 100. Stakeholders and their possible roles in the SRI certificate process (simplified overview)

Stakeholders	Possible roles in the model certification process
Owners	They have to authorize the use of building data for other purposes (such as facility management). authorise the assessment and pay for it
Tenants	Have to give access to SRI assessors to do the onsite visit
Designers	Provide plans and descriptions preferably in digital format, according to BIM standards
Project managers	Make sure that latest information is documented
Facility managers	Are in charge of a building's facilities Have detailed information about total operational cost, including energy, maintenance and repair Have the maintenance and repair plan where identified improvement measures could be integrated Could be SRI assessors for the maintenance and fault prediction part of SRI contribute details of all the technical systems installed
Contractors	Update plans and descriptions if changes compared with the plan occur during constructions works
Device manufacturers	Register their product data in product databases to make them easily accessible for building assessment
Energy management companies	Are authorised to do energy audits Have all the information included in energy audit reports Could be SRI assessors for the energy efficiency part of SRI
Energy Service Company (ESCO)	Are in charge of carrying out the energy management improvement projects, based on an energy audit's data; should have all the related information
Utility companies	Have detailed operational energy and water consumption data accessible to building owners through smart meter portals Could be SRI assessors for the energy flexibility part of SRI
SRI assessors	Need to have access to building data to do the assessment, and the building to be classified
Certification companies	Hold supporting software and other tools such as guidelines to facilitate the work of the SRI assessor Hold the data of certified buildings

	Make sure that SRI assessors work according to standard Do quality control at the level of SRI assessors
State agencies	Administrate the register of qualified SRI assessors Run the independent control system (quality checks) Hold the data of certified buildings

As it was anticipated, some exceptions and differences arise depending on the country. Some examples are listed below:

- Project manager is rarely used for Real State in Spain. The most common position used is “Dirección Facultativa” (DO) performing the duties Project Managers assume in other countries.
- Spanish Quality Control companies can issue certificates like SRI or EPCs. This role is restricted to Energy Management companies in Austria.
- ISO 50001 certification bodies are not in the table but they can be considered also as a potential SRI certification company because of the buildings data they collect.
- **In Austria**, multi-unit residential buildings are difficult to assess because occupants are not obliged to grant access to SRI assessors. Regarding facility managers, there is a big difference between residential buildings and non-residential buildings in terms of roles and responsibilities. ESCOs have a central role in non-residential buildings of the central government.
- **In the Netherlands**, municipalities and environmental services have access the inspection register, therefore they can be involved in the certification process to provide relevant information. The role of the facility manager can be different in residential and non-residential buildings. The ESCo market in the Netherlands is not similar to Austria, Germany, or France, where a lot of buildings are being refurbished with applying energy saving measures as a result of projects executed by energy service companies. However, the market for new buildings has grown.

Once the main stakeholders of the process have been identified, some options of their responsibilities are going to be analysed. The key aspect that governs what their responsibilities can be is the way the certificate is issued and by whom. Although it is a topic discussed in another chapter, we must anticipate here that the options considered are:

- Self-declaration by the Building owner.
- Facility managers, Property managers or Project managers make a self-declaration on behalf of the building owner.
- SRI assessors issue the certificate with the information collected in a site visit.
- SRI assessor issue the certificate using available TBS documentation.
- SRI certificate is automatically generated based on data included in the building logbook.

The following tables show the potential responsibilities of the identified stakeholders in the scenarios identified with what the corresponding Pros and Cons identified.

Table 101. Stakeholders responsibilities when SRI is a self-declaration by building owner or tenant, or by certain stakeholders on behalf of building owner or tenant

Stakeholders	Responsibilities of identified stakeholders: non-residential	Responsibilities of identified stakeholders: residential
Owners	Initiate and do self-declaration	
Tenants	Initiate and do self-declaration	no role
Designers	Provide plans and descriptions preferably in digital format Do self-declaration on behalf of the building owner or the tenant	Provide plans and descriptions preferably in digital format Do self-declaration on behalf of the building owner
Project managers	Make sure that the latest information is documented Do self-declaration on behalf of the building owner or the tenant	Make sure that the latest information is documented Do self-declaration on behalf of the building owner
Facility managers	Provide information Do self-declaration on behalf of the building owner or the tenant	Provide information Do self-declaration on behalf of the building owner
Contractors	Update plans and descriptions if changes compared with the plan occur	
Device manufacturers	Register their product data in product databases to make them easily accessible for building assessment	
Energy management companies	Provide information	
Energy Service Company (ESCO)	Provide information	
Utility companies	Provide information	
SRI assessors	No role	
Certification companies	Provide information	
State agencies	Run the independent control system (quality checks) Provide information	

ADVANTAGES	DISADVANTAGES
Cheap process for the building owner or tenant.	Low credibility of certificate; hardly useful as a proof which is probably needed to benefit from new tariff systems (energy supply), or for other purposes.
	Difficult to organize the independent control system at low cost.

Table 102. Stakeholders responsibilities when SRI is automatically generated using building logbook information

Stakeholders	Responsibilities of identified stakeholders: non-residential	Responsibilities of identified stakeholders: residential
Owners	Initiate self-declaration	
Tenants	Initiate self-declaration	no role
Designers	Provide plans and descriptions in digital format to the logbook and assessment tool	
Project managers	Make sure that latest information is documented in digital format to be transferred to the logbook and assessment tool	
Facility managers	Provide information in digital format to the assessment tool	
Contractors	Update plans and descriptions in digital format if changes occur and provide this information to the logbook and assessment tool	
Device manufacturers	Register their product data in product databases to make them easily accessible for the logbook and assessment tool	
Energy management companies	Provide information in digital format to the logbook and the assessment tool	
Energy Service Company (ESCO)	Provide information in digital format to the logbook and the assessment tool	
Utility companies	Provide information in digital format to the logbook and the assessment tool	
SRI assessors	No role	
Certification companies	Provide information in digital format to the logbook and the assessment tool	
State agencies	Run the independent control system (quality checks) Provide information in digital format to the logbook and the assessment tool	

ADVANTAGES	DISADVANTAGES
Process for owners and tenants is cheap and credibility of certificate is high.	A building logbook needs to be implemented where up-to-date and quality-checked information is stored.
Independent control system can be implemented at low cost based on checking of random samples.	Effort is necessary to define the elements of such a building logbook, and how data transfer can be managed, ensuring quality at the same time.
	The building logbook can be represented by a BIM model, but currently, this is only realistic for large non-residential buildings where a dedicated BIM manager is employed.

Table 103. Stakeholders responsibilities when SRI is issued by a Second or a Third party entity

Stakeholders	Responsibilities of identified stakeholders: non-residential	Responsibilities of identified stakeholders: residential
Owners	Authorize the use of building data collected for other purposes (such as facility management) Give access to SRI assessors to do the on-site visit	
Tenants	Authorize the use of building data collected for other purposes (such as facility management) Give access to SRI assessors to do the on-site visit	Give access to SRI assessors to do the on-site visit
Designers	Provide plans and descriptions preferably in digital format	
Project managers	Make sure that latest information is documented	
Facility managers	Provide information	
Contractors	Update plans and descriptions if changes compared with the plan occur	
Device manufacturers	Register their product data in product databases to make them easily accessible for building assessment	
Energy management companies	Provide information	
Energy Service Company (ESCO)	Provide information	
Utility companies	Provide information	
SRI assessors	Collect all information for carrying out the assessment, including documents of proof Carry out the assessment and submit to certification unit	
Certification companies	Issue the certificate Run the register of SRI assessors Run the register of SRI certificates Offer and maintain SRI trainings	
State agencies	Run the independent control system (quality checks) Provide information	

ADVANTAGES	DISADVANTAGES
Reliable certificate because quality assurance can be implemented at several stages: training of assessors, procedure of data collection, application of assessment tool.	Setting up the certification scheme is relatively expensive: trainings including examination, registration system, etc.
The establishment of the independent control system is facilitated by the existing procedures.	Maintaining the certification scheme is relatively expensive; a certain number of SRI certifications will be necessary to generate sufficient contribution to maintain the certification scheme. However, currently there is no strong motivation for owners and / or tenants to hire an SRI assessor to issue an SRI certificate.
	Data collection can involve some effort, the SRI assessor has to be paid for data collection and the preparation of the verification documents.

10.2 Information and data that may be needed

The main goal of this sub-section is to analyse the different sources of data to calculate the SRI and provide a Pros and Cons analysis for each option. In addition, some of the differences coming from the specific structure of the construction and real estate businesses in the different countries is included.

First of all it is important to know what is the minimum data required for a SRI calculation:

- Architectural finishings description regarding thermal insulation components.
- TBS description.

- Technical sheets of electrical systems.
- BACS description: hardware and software, operational profile, taking into account how challenging can be to obtain an up-to-date description of BACS. If the construction of buildings is financed by investors, the building automation and control system is not implemented and programmed until the user has been determined. The adjustment of the technical building systems including BACS which is always needed during the first year of operation is usually not part of the company contract and thus is not done.

Another point is the identification of the most common entities that must provide the information. In general is the building owner who provides data for the SRI calculation. When a facility manager exists, owners use to ask them to provide that information. In small buildings can be needed a site visit to get the data on site. Other source can be the building logbook but considering that in general it will only contain the as built information without any later modification. Hopefully soon, everything will be available in building digital twins or in BIM models.

Another important topic is how to extract the information of logbooks, digital twins or BIM models. The use of specific software can be a barrier. Even the exchange formats often result in loss of information. SRI assessors or SRI calculation tools won't be compatible with all the existing software products. Cost of licenses and required training time for each one is another issue. used, and obtaining usage licenses can be expensive. Therefore, the information will most probably have to be obtained in the form of PDF files, losing the advantages of an automatic calculation. A solution can be the definition of a standard way to organize the information.

Regarding the type of building it is important to know that information in existing buildings use to be obsolete and must be collected on site meanwhile new buildings have enough and proper data in the detail design documents that can be different in each State Member:

In Spain the “libro del edificio” (building’s logbook) contains all the information concerning the building and its control and regulation systems. The building’s logbook is part of the final construction documentation and includes all the elements and systems existing in it, the maintenance standards and uses and care to be taken into account.

It also includes technical sheets for the equipment and systems, instructions for use, and all the information that the user needs for the correct functioning of the building.

In the Netherlands, the “passport for constructions” is being developed, which has the similar aim as DBL, ensuring that relevant data of constructions along the chain become digitally available for several purposes. However, it is not used yet. On the other hand, the EPC or energy labels of the buildings are available on a national database, called EP-online.

In Austria, the EPC database of the province of Salzburg offers the function of a building logbook. The building owner has a specific account where all EPC versions of the building are stored, the building renovation roadmaps, energy consumption data, and all other information the building owner wishes to upload. The building owner can then grant access to the account to third parties. However, in practice this function is not much used.

Once we have identified main sources of information, a table showing main types of information has been prepared.

Table 104. Possible sources of data including advantages and disadvantages

Sources of data	Advantages	Disadvantages
Building Logbook	It contains all the information concerning the building and its control and regulation systems	Not yet available in all Member States; different approaches towards building logbook
3D model, BIM	If properly set-up and maintained, all relevant up-to-date information should be included	Usually only available for large new construction
Initial design	Always available	Usually not up-to-date
As built drawings	Represent the actual building status	Not always available due to last minute changes at the construction site
Architectural description	Always available for new buildings	Usually not up-to-date (e.g. shading

		devices planned but not implemented); Often not available for existing buildings
TBS description	Always available for new buildings	Usually not up-to-date (e.g. PV plant added later, e.g. 2 years after completion of construction); Often not available for existing buildings
BACS description, hardware and software	Should be available if there is a facility management	Documentation often not up-to-date
Plant and device technical sheets	Always available for new buildings	Usually not up-to-date (e.g. PV plant added later, e.g. 2 years after completion of construction); Technical sheets of built-in devices in existing buildings often not available
Updated plans in case of changes in the building	Represent the actual building status	Not always available due to last minute changes at the construction site
Updated devices technical sheets in case of changes in the building	Usually available	Usually not up-to-date (e.g. PV plant added later, e.g. 2 years after completion of construction)
EPC	The EPC and underlying energy simulations provide basic information about the energy efficiency potential	Depending on the Member State, the EPC alone does not always contain the necessary information in sufficient detail; specifically, the EPC does not provide information concerning the building's management and control systems
Energy audit report	An investment-grade energy audit report contains much of the needed information, if not all – depending on the target of the energy audit report	An investment-grade energy audit is expensive
Technical due diligence	The technical due diligence report contains much of the needed information, if not all – depending on the targets of the technical due diligence report	A technical due diligence is expensive

Of course, the compilation above is in a way simplified and generalised, and in different countries, specific aspects will need to be considered, such as in Spain:

- There is not usually much project documentation in existing buildings' projects.
- There are new buildings that do not have as built documentation.
- In existing buildings, there is not always an architectural description
- In existing buildings, there are no technical datasheets of devices.
- The EPC does not provide information concerning the building's management and control systems, so it is not valid for the issuance of the SRI certificate.

In Austria, the situation is similar like in Spain (and probably most countries) for existing buildings, namely that documentation is bad, especially for residential buildings. For non-residential buildings, the situation is usually better. In terms of TBS, the Austrian EPC does not contain sufficiently detailed information to be useful for SRI assessment.

In the Netherlands, the situation is similar to Austria and Spain. The EPC does not provide information about the BMS. It includes the type of technical systems, but no detailed information.

10.3 Different options of stakeholder communication flows

This sub-section presents an analysis of the main options to organize the communication between SRI stakeholders. Every combination is based on the type of expert or entity in charge of the Certificate preparation. The results obtained are showed in the following tables that include pros and cons of each option.

Table 105. First Party Certification (Conventional self-declaration / Automatically generated self-declaration)

From stakeholder(s)	To stakeholder(s)	What to communicate	Communication format
Device manufacturers/ Technology providers	All (Contractors/ Designers)	Product data sheets	Websites and portals
Contractors/ Designers	Project Managers	Providing the final documents and updates	Reports and documentation/ Digital logbook
Project managers	Facility managers/ Owners	Providing all the information	Reports and documentation/ Digital logbook
Energy management companies/ Energy service companies/ Utility companies	Owners/ Facility managers	Providing energy related information (real-time performance data)	Websites and portals
Owners/ Tenants	Facility managers	Request of self-declaration on behalf of the owner	
Facility managers	Certification companies/ State agencies	Providing the SRI certificate	Websites and portals
State agencies	?	SRI assessment tool, Guidance documents with requirements and templates.	Websites and portals

ADVANTAGES	DISADVANTAGES
The process can be planned to be aligned with the latest changes/updates of the building.	Owners are the pivotal point of this flow, which can be not knowledgeable enough about the SRI certification processes.
The user has more control and autonomy.	All the stakeholders in the end user group (owners, tenants, etc.) might not have the knowledge to use the digital logbook. In this case, the facility manager can communicate accordingly.
The digital logbook would also be a centric communication tool, which increases the accuracy, and efficiency.	All the stakeholders in the consultants group (designers, contractors, manufacturers) might not have the knowledge to communicate the information into the digital logbook. In this case, the project manager should provide all the information into the digital logbook.

Table 106. Second Party Certification

From stakeholder(s)	To stakeholder(s)	What to communicate	Communication format
Device manufacturers/ Technology providers	All	Product data sheets	Websites and portals
Contractors/ Designers	Project Managers	Providing the final documents and updates	Reports and documentation/ Digital logbook
Project managers	Facility managers/ Owners	Providing all the information	Digital logbook
SRI Assessors	Owners/ Tenants	Request for information and on-site	Official letters and notices

(certification companies)		visit	
Owners/ Tenants	SRI Assessors (certification companies)	Authorizing the use of information and access to the building	
Energy management companies/ Energy service companies/ Utility companies	SRI Assessors (certification companies)	Providing energy related information	Websites and portals
Certification companies	Owners/ State agencies	Providing the certificate	Websites and portals

ADVANTAGES	DISADVANTAGES
The SRI assessors/ Certification Companies have the pivotal role, who has the required knowledge and expertise.	Requires more initial setup and communication tools.
	It can lead to more bottlenecks and delays.

Table 107. Third Party Certification

From stakeholder(s)	To stakeholder(s)	What to communicate	Communication format
Device manufacturers/ Technology providers	All	Product data sheets	Websites and portals
Contractors/ Designers	Project Managers	Providing the final documents and updates	Reports and documentation/ Digital logbook
Project managers	Facility managers/ Owners	Providing all the information	Digital logbook
SRI Assessors	Owners/ Tenants	Request for information and on-site visit	Official letters and notices
Owners/ Tenants	SRI Assessors	Authorizing the use of information and access to the building	
Energy management companies/ Energy service companies/ Utility companies	SRI Assessors	Providing energy related information	Websites and portals
SRI Assessors	Certification companies	Conduct SRI assessment and submission of SRI assessment	Websites and portals
Certification companies	Owners	Providing the certificate	Websites and portals

ADVANTAGES	DISADVANTAGES
The SRI Assessors can be assigned based on the user's requirements.	More parties included, and more communication is required.
Lower risks of bottlenecks, due to more flexibility and availability of SRI assessors.	Requires more initial setup and communication tools.
	Communication procedures might be more time consuming.
	There can be a higher risk of inconsistency in communication.

Third party certification can benefit from the potential synergies between SRI assessment and national EPC system.

It is important to mention that Member States identify the synergies between SRI assessment and other building performance assessment schemes, therefore, in those cases, the establishment of the communication flows would be different¹.

10.4 Certificate format options

The objective of this part is to show different options for the SRI certificate format. Each case is accompanied with a pros and cons analysis.

As a starting point for analysis, EPC formats of partner countries are presented.

Austria: The format of the first two EPC pages is defined by law, that means basic information, the assessment scale, and the indicators. The EPC refers to the whole building or a building zone with the same type of use

The screenshots below show the first two EPC pages for residential buildings. The format can vary among provinces depending on the regional legislation. The EPC is handed over to clients in digital format together with all other building documentation (mainly new buildings), and in paper format (new and existing buildings). In the administration, the EPC is processed digitally via XML upload interface from the calculation software to the EPC database. The building owner can give access to third parties to the own building documents in the EPC database. There have been changes in 2011, 2015, 2019, 2023, meaning that different EPC versions are in the market.

Spain: EPC content and format in Spain is defined in a law. Main point is the letter from A to G that indicates the energy efficiency of the building. All the relevant information of the building or the part included in the EPC has to be listed, especially location, specifications of the elements that integrate its thermal envelope and those using energy (i.e., heating, cooling, hot water, lighting, etc). Finally, the name and qualification of the expert signing the EPC is required.

There are some free software to prepare EPCs in Spain. Outputs are a hardcopy of the EPC in pdf format and a xml file containing all the information used and the calculations. EPC format is shown in the following pictures.

INDICADOR GLOBAL		INDICADORES PARCIALES	
	1.012 C	CALEFACCIÓN Energía primaria calefacción (W/m².año) 102.34	ACS Energía primaria ACS (W/m².año) 1.19
		REFRIGERACIÓN	ILUMINACIÓN

CALIFICACIÓN ENERGÉTICA DEL EDIFICIO EXISTENTE ETIQUETA

DATOS DEL EDIFICIO

Normativa vigente construcción / rehabilitación:

Inserte aquí la normativa vigente

Tipo de edificio:

Inserte aquí el tipo de edificio

Dirección:

Inserte aquí la dirección

Municipio:

Inserte aquí el municipio

C.P.:

Inserte aquí el código postal

Referencia/s catastral/es:

Inserte aquí la referencia catastral

C. Autónoma:

Inserte aquí la C. Autónoma

ESCALA DE LA CALIFICACIÓN ENERGÉTICA

	Consumo de energía kWh / m ² año	Emisiones kg CO ₂ / m ² año
A más eficiente		
B		
C	XX	
D		XX
E		
F		
G menos eficiente		

REGISTRO

Inserte aquí el número de registro:

Inserte aquí la fecha como dd/mm/aaaa:

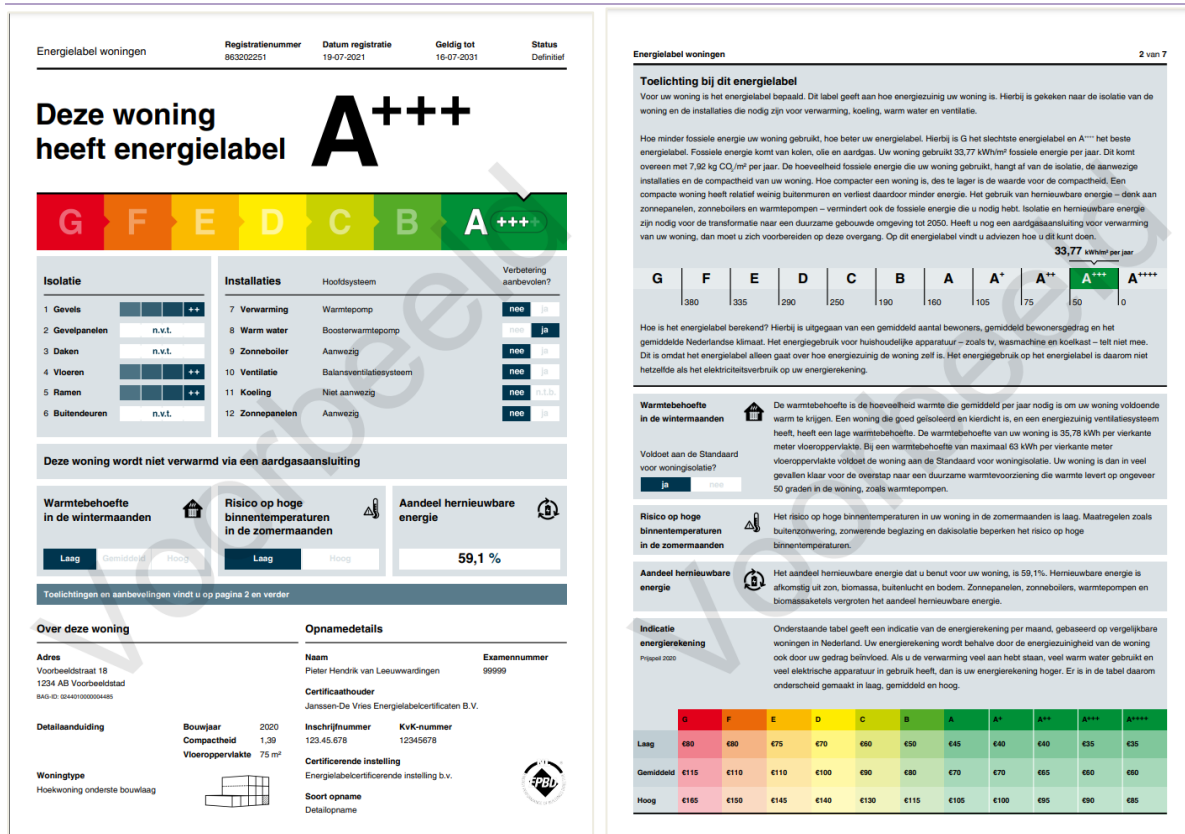
Válido hasta dd/mm/aaaa:

ESPAÑA 

Directiva 2010 / 31 / UE

The Netherlands: The EPC, or *energielabel* in Dutch, indicates the energy efficiency of the two categories of residential and non-residential buildings in the Netherlands. The classification has the highest rank of A++++ to the lowest rank of G. The EPCs for residential buildings include the information about how a building can be more energy efficient, considering insulating the roof or installing solar panels, in addition to whether the house can be easily disconnected from gas, whether the roof, floor, or windows still need extra insulation to switch to an electric heat pump or a connection to a heating network. Therefore, it indicates the insulation level, and target values of optimal insulation for roof, floor, and windows. The target values for an old house are lower than for a new built.

The EPC system in the Netherlands has been implemented since 2008. A new system was implemented in 2015, and at the latest, in 2021, a new energy performance calculation method (NTA 8800) is implemented. The screenshots below show the format of the current EPC.



EPCs have been analysed because of the similarities with the SRI certificates. From that starting points, we have considered the options of digital vs just hard copies. We have also analysed the differences that may arise from the type of building.

✓ Digital certificate s

A digital certificate provides many advantages compared with a purely hard copy certificate. There are a few disadvantages, but they are outweighed by the advantages.

ADVANTAGES	DISADVANTAGES
Does not get lost	Assessment tools need the function to produce a certificate
Can be included in the digital building logbook	Assessment tools need interfaces with the relevant data environment
Can be updated if underlying data change	Assessors need equipment and access to the tools
Can be printed if needed	Electricity and Internet needed during assessment
Different types of user targeted information can be extracted from the database	Back-up is needed
It cannot be forged, as it has an electronic signature.	A device is required to store the certificate.
It can be obtained at any given instance from the register.	

✓ Physical certificate

We believe that the physical certificate format has more disadvantages than advantages, and it should not be contemplated.

ADVANTAGES	DISADVANTAGES
No device is required to store the certificate.	It is necessary to go to a physical register to obtain it.
	It can be easily forged by doing photocopies
	In order to send it, it is necessary to photocopy it.
	There is only one original certificate.
	It can get lost.

Regarding the differences that can bring the building use the following topics must be considered:

➤ Residential buildings.

For this kind of building, user friendly formats for the certificate are normally required, like those used for EPCs. Content can be limited to the most basic data concerning the building (location, land register reference), SRI score with accomplishment percentages corresponding to each of the key functionalities and information about the expert signing the certificate.

ADVANTAGES	DISADVANTAGES
The user can easily interpret it	Lack of information in buildings with a higher connectivity level and prepared for intelligent applications
Easy comparison of the SRI ratings obtained by different buildings	Buildings with various uses will need to have different certification formats
Similar format to that of the energy certificate's label	Lack of information concerning the accomplishment percentages corresponding to the impact criteria and technical domains
	The evaluation programmed will have to be able to issue different kinds of certificates.

➤ Non residential buildings

A more detailed certificate will be required in this case. Minimum content should include also the intended use of the building, the accomplishment percentages corresponding to the technical domains and the impact criteria and the accomplishment percentages corresponding to each of the key functionalities.

ADVANTAGES	DISADVANTAGES
Detailed information regarding accomplishment percentages of every value assessed.	The complexity of the application's design is increased, due to having to generate a different format for every use of the building.
	Comparing buildings with different uses gets increasingly difficult (for instance, comparing a hotel to a residential building).

We do not find any reason to establish differences in the certificate format depending on other uses classification.

We have also analysed other potential reasons to design different types of certificates but our conclusion is that the procedure and the format can be the same:

- Depending on the climate zone.
- Depending on whether the whole building is under assessment of just a part of it. The only point is that the document must clearly show the areas covered.

- Depending on whether the evaluated building is new or an existing one. SRI does not depend on the building age. The main difference may be in the source and quality of the information used, a point that must be explained always.

Therefore, we only see a difference in the residential buildings where users may need easier formats to better understand the meaning of the SRI rating. On the contrary, other type of building owners will demand a much more detailed document. They will likely want to invest to increase the asset value or to reduce energy consumption.

The SRI addresses property managers/owners, building users, and the electricity sector. While building users need easy to understand information, property managers and the electricity sector might need more detailed and specific information. A certificate that fits all purposes would be based on information stored in a database which is then extracted depending on the respective target group and further processed to meet the requirements of the respective target group. It is important that the certificate includes the technical documentation of TBS the assessment is based on. The certificate as such should be very simple and robust to avoid future changes, in order to avoid confusion on the market as sometimes experienced with the EPC.

10.5 Certificate issuance options

Another important process analysed is the procedure to issue the certificates. Using the experience with other types of similar certificates, main options have been studied.

- **AUTOCERTIFICATE (OR FIRST PARTY CERTIFICATES)** It is the procedure used sometimes with EPCs. In this model, SRI certificates would be issued by the owner of the asset. In some cases the owner can be also in charge of the registration of the document in the corresponding entity. Another option is to rely that task in a Certification Body.

ADVANTAGES	DISADVANTAGES
It is the cheapest method, both for the committee and to the users.	Certifiers have not undergone any accreditation process, so they are unaware of their technical capabilities.
It is the easiest method.	Little reliability of the parameters included in the document for the register.
The certifier introduces the register platform	High variability of results, as the parameters included in the register's document depend on the owner's criterion.
The certifier is the one to issue the certificate	The register has to be created.
	The process is expensive from the registrar's point of view, as technical support is required.

- **SECOND PARTY CERTIFICATE**, following the method used for the energy related LEED certification):

In second party certification, an association to which the individual or organization belongs provides the assurance. The second parties in this context can be defined as the entities who are directly involved in the certification process. This may include the certification body, auditors, or any other entity who is engaged in assessment of SRI.

ADVANTAGES	DISADVANTAGES
The Certification Body has to evaluate and approve technicians and companies valid to issue the reports of the state of the building, so the Body bears control over the companies and experts issuing those reports.	An accreditation scheme for entities or technicians has to be created based on which companies or technicians can be accredited, in order to issue the reports based on which the certification can be obtained.
Complete control over the certification process.	Expensive process from the certifier's point of view.
The Body establishes the accreditation criteria for technicians and Companies.	A platform onto which both the accredited technicians and enterprises can upload their reports has to be created; the platform will also be the source from which the certificates will have to be issued.
The Body is the only entity that issue certificates, based on reports sent by accredited technicians or companies.	A structure of technicians will have to be created, so that they can accredit the companies or technicians, based on the accreditation scheme, and so that they can verify the reports they upload to the platform.
	The accreditation prices are fixed by the Body and the accredited companies or technician fixes their fees based on the job.

- THIRD PARTY CERTIFICATE, using the existing method for BREEAM certification.

Third party certification involves an independent assessment declaring the fulfilled requirements. The third parties in this context can be defined as the external parties that are independent of both the certifying body and the owners. These may include organizations and individuals who provide expertise for assessment.

Main difference with the Second Party model is the once an expert or an entity is accredited by the body, they can directly issue certificates. They would also have to register all the documentation.

ADVANTAGES	DISADVANTAGES
The Body accredits technicians and Companies to issue the reports of the state of the building, so it bears control over the enterprises and the professionals issuing those reports.	This certification scheme does not allow the existence of the accredited technician, as he would have to manage the certificates' register
Complete control over the certification process.	An accreditation scheme for companies or technicians has to be created based on which companies or technicians can be accredited.
The Body establishes the accreditation criteria for technicians and Companies.	
It is an expensive process, but it is less expensive than the previous one.	It is still an expensive process, although it is less expensive than the second party certificate.
It is a more flexible process than the second party one, since, as the accredited companies are the ones certifying, they can adapt the task easily to each client's needs.	
The certifying company is the one that fixes the price, and it pays certain taxes to the Body, so the cost of the certificate is less than that of the second party one (more competition).	
The accredited companies would be certifying other companies, so the register and the work methodology would already be organized (an already created structure).	

MIXED CERTIFICATION SYSTEM. Trying to get the best of the above described options, a mixed one is designed here. The idea is that once an evaluation procedure is approved by the Body, any accredited company or expert would be able to calculate SRI and issue the corresponding certificate. The body will be only in charge of the register.

ADVANTAGES	DISADVANTAGES
The Body accredits technicians and Companies to issue the reports of the state of the building, so it bears control over the enterprises and the professionals issuing those reports.	An accreditation scheme for Companies or technicians has to be created.
Complete control over the certification process.	A structure of technicians will have to be created, so that they can accredit the companies or technicians, based on the accreditation scheme
The committee establishes the accreditation criteria for technicians and enterprises.	It is still an expensive process, although it is less expensive than the second party one.
It is a more flexible process than the second party one, since, as only accredited companies will issue certificates, they can adapt more easily to each client's needs.	
The certifying companies would fix prices, affording certain taxes to the Body, so the cost of the certificate would be less than that those of the second party model (more competition).	
As a public administration or the Body is in charge of the register, its continuity is assured.	
It allows the accreditation of independent technicians.	

10.6 Certificate registration options

Another important part of the process is the registration of the certificates. Main options have been analysed.

- State agencies. In this case, a state-owned agency would create and maintain a register that would be accessible using a dedicated web page. It would be a similar procedure that what is done for EPC in most Member States.

ADVANTAGES	DISADVANTAGES
Being a public organism, the register's continuity is assured.	Being a public administration, change or adaptation processes are longer and more complex.
The public organism makes sure that the registered certificates fulfill the reference guide requirements concerning content and structure.	Each administration could have different access rules, and ask for different requirements.
The administration would be able to conduct random audits to buildings to verify the truthfulness of the data included in the register, or doing so through collaborator enterprises.	Each administration could apply different fees for the registering of these certificates.
The administration can impose fines if the registered data does not match reality.	Impossibility of having statistical data if public administrations do not publish them.
Being a register conducted by the administration, it is official.	Impossibility of having an accessible list of registered buildings, if public administrations do not publish it.
Registers can be homologated throughout every country in the EU.	
The register's validity is unquestionable, once validated by the administration.	
Public administrations already have habilitated registers for the issuance of certificates.	
Public administrations can publish statistic data concerning the number and results of the registered certificates.	

- SRI committee, as it is done with LEED or BREEAM certifications. There would be a SRI agency in charge of the register. For that aim, a platform (WEBSITE) would have to be created, onto which all the documentation would have to be loaded by certifiers.

ADVANTAGES	DISADVANTAGES
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Being the SRI committee, the register's continuity is assured.	It would be complex for the committee to conduct random audits to verify the truthfulness of the data included in the reports.
Being the committee the one in charge of the register, it is assured that every registered document fulfills the reference guide requirements concerning content and structure.	The committee would have to create the platform for the registering of the data.
Registers can be homologated in every EU country.	The SRI committee would have to assure the maintenance of the platform with a minimum personnel structure.
Easy to adapt to every change from the reference guide.	
Owning the SRI committee the register, it would have available statistical data concerning the number of registered buildings, their rating...which could be available to the public.	
The access to the register would be the same in every EU country.	
The register fees would be the same across the EU.	

- Private registration sites managed by Certification bodies.

ADVANTAGES	DISADVANTAGES
Certifying enterprises already have installed a register system that stores the certificates they issue.	The application has maintenance costs linked to it, so the register cannot be free.
The register's continuity is assured.	
Easy to adapt to any change from the reference guide.	
If they have not made the report on the state of the building, they can conduct audits to ensure the truthfulness of the data included by the auditor.	
Statistical data concerning the number of buildings registered, their ratings...would be available. And the results' reports could be published through the SRI web.	
Registers can be homologated in every EU country.	

10.7 Options to update certificates

The updating of the certificates can be handled based on different approaches:

- ✓ Time-based: the certificate should be renewed in a specific frequency of years (for instance 3, 5, or 10 years). The intervals can be defined based on the type of building.
- ✓ Synchronization with other certifications: the updating of the certificate should be reassessed while another certificate, such as EPC, is required to be done.
- ✓ Synchronization with maintenance: the updating of the certificate may be synchronized with the major maintenance periods of the building.
- ✓ Synchronization with building systems: the updating of the certificate should be reassessed at the same time as specific building systems are upgraded, such as installation of smart meters, or major renovations.
- ✓ Synchronization with change of user: the updating of the certificate should be reassessed if the user's behaviour and demands are changed.

10.8 Discussion points taken into account in the analysis of the process

10.8.1 Overview of energy performance certification process

A typical energy performance certification scheme is described in the table below as the starting point for discussing SRI certification. It needs to be noted that quality assurance is essential at two levels: the level of the EPC regarding the quality of input data, and the level of independent experts regarding the quality how input data is used.

Table 108. Overview of typical energy performance certification scheme

Step in the certification process	Actor 1	Activity 1	Actor 2	Activity 2
License for EPC issuance	Independent expert	Training, examination, submission of certificates of competence	Authority; vocational training institute	Training; check of qualification
Register of EPC experts	Independent expert	Registration	Authority	Checks certificates of competence as precondition for registration
Contract for EPC	Independent expert	Contract signature	Building owner	Checks for EPC expert and awards contract
Registration of EPC in the building database	Independent expert	Registers the EPC		
Data acquisition	Independent expert	Data collection or use of default data, depending on type of building and type of EPC		
Energy model and EPC calculation	Independent expert	Using approved software to generate the legally valid EPC based on an energy model		
Quality check	Independent expert	Submission of EPC to independent control system (which is often covered by the EPC database)	Authority	Independent control system: checks the EPC and, as a consequence, the independent expert
Storage in EPC database	Independent expert	Upload to EPC database	Authority	Accepts upload to EPC database

10.8.2 Differences between the SRI certificate and other certificates

The main differences between the SRI certificate and other certificates (mainly the EPC certificate and the certificate based on the ISO-50001 norm) have been analysed. It is necessary to state the following:

- ✓ Control devices: In order to issue the SRI certificate, that the building has certain control devices or facilities (thermostats, flow controllers...) is not enough. It must be assured that these devices work properly, and that they are well programmed (we have encountered cases where the BMS programming was not correct).
That is why the SRI certificate differs from the energy efficiency certificate, because not only does the kind of device have to be verified (in the energy efficiency certificate, verifying the closing systems' composition, width, characteristics...is enough), but its correct functioning also has to be assured.
- ✓ In order to issue the SRI certificate, either there is a certificate from the enterprise in charge of maintenance justifying the correct functioning of these systems, or it will have to be verified by the assessing technician. Obtention of information: when it comes to energy certification, the most precise information about the building's thermal enclosure, can be obtained from the project's documentation. However, when it comes to existing building's SRI certificates, taking into account that the characteristics of control and management devices have an important weight on the building's assessment, and, as these devices are usually replaced from time to time by more advanced devices, with better aspects, it is necessary to visit the building to verify the characteristics of those devices and systems.

10.8.3 Considerations about the need for the certificate's calculation process to be public

Just as it has been indicated, if the certificate is accompanied by a .xml file, it is not necessary to include the information regarding the calculations on the certificate, but, from that file, the stakeholders who may need it, would be able to obtain that information from a viewfinder, similar to the existing ones for the EPCs.

This is the reason why the SRI certificate's calculation process (the ratings based on which the scores are established) should not be accessible for users, although it should be available for technicians, just as it happens with the EPC certificate.

10.8.4 Considerations about the need for the issuance of different certificates depending on the type of building

Even though we currently establish that the SRI Certificate Process is independent from the kind of building under assessment, we have to examine if certain aspects of the SRI certificate require certain adjustments for the different type of buildings.

In general terms we can say that when obtaining the SRI rating of a building, it makes no sense to differentiate between buildings with different uses (when defining the assessment scale), because that score only depends on communication and control internal systems. That is the reason why, when defining the definitive SRI certificate's format, and its content, it will be possible to differentiate between buildings with different uses; but the assessment scale must be the same. However, the following aspects must be considered:

- ✓ If we take Spain's case as an example, it should be taken into account that new residential buildings have collective HVAC installations, and although each building has individual devices to measure energy consumption (thermal energy meters), the control of production units is regulated on a building level. That is the reason why the SRI certificate should include the possibility of indicating if certain installations are individual or collective; as in the second case, owners cannot regulate production units (production temperature, working schedules...).
- ✓ This also happens in the case of any building in a multiownership regime, or with different tenants (office buildings, buildings used for administrative purposes; with various different enterprises set up in the building).

- ✓ In the case of residential buildings, in the calculation of the SRI rating a better score for houses equipped with demand control devices connected to the network. These devices should have the capacity of being regulated from a phone (either acting on the production units operation, in the case of individual production units, or acting on the energy cutting devices in the case of installations with collective production units).
- ✓ With the current procedure, the reach and content of the inspection for buildings with different intended uses is already distinguished, and that is the reason why in the entry data the intended use of the building is selected. In accordance with this, we have not found any other differentiation aspects that should be introduced.

10.8.5 Considerations about the certification process

Exhaustive analysis of each step in the certification process; as well as in the obtention of data, the evaluators' training, the registering, the quality assurance, etc.

ANALYSIS

- ✓ The SRI certification process should start with the definition of the accreditation, qualification and score of the technicians in charge of carrying out the job and issuing the certificate. The first question that is formulated is to determine, in each country, these exigences.
- ✓ Just as it happens with the energy efficiency certificate, the technicians in charge of issuing the SRI certificate will need to have a certain minimum proved knowledge, both in buildings' control and management systems, and in the use of the assessment tool. Each country will be able to define which are the criteria to prove this minimum knowledge.
- ✓ In any case, it should be necessary that in every country SRI certifiers have a minimum training, and to do so, certain specific courses should be designed, not allowing untrained people to issue SRI certificates.
- ✓ Concerning the data obtention process, the onsite visit has to be mandatory, not allowing certifiers to obtain the information from the owners, and to issue the certificate based on that information, as the owner will, in most cases, not have the necessary knowledge to identify the different systems and their specifications (types of controllers...) and because the owner can send information that is not completely truthful.
- ✓ In this data obtention process, the certifying technician will have to count on the building's maintenance services' support, and in the case of residential buildings, the technician will base his judgements on the houses' owners' clarifications, but always verifying on site that those clarifications are truthful.
- ✓ In the case of buildings with more complex control and regulation systems, the SRI certifier will have to count on the maintenance technicians' support to verify the functionalities of the systems; as well as the type of control of regulation devices over the equipment. The technician will also have to verify the connection to the network of information transmission devices.
- ✓ Furthermore, the data obtention process has to be done rigorously by a competent technician, with enough knowledge to distinguish different regulation and control systems (isolated systems, connected systems, individual or collective actuation systems...) and, above all, to be capable of identifying if these systems work properly and adjust to the variable regulated by the procedure. That is the reason why they will, additionally, have required minimum measuring equipment (equipment to measure temperature, air flow...).
- ✓ Once the data obtention has been carried out onsite, the certifying technician will issue the certificate from the application itself, and, depending on the obtained rating, the already mentioned application ought to have the possibility of including improvement measures to obtain a better score. Once the process has been completed, the certifying technician will include its data and will sign the certificate.
- ✓ Just as it happens with the Energy Certificate, the different countries will have to enable the registering of the certificates; and the building's owner will be the one in charge of registering it.
- ✓ To ensure the accuracy of the process, and similar to what happens in some countries with the energy certificate, a system of control and quality assurance should be established. Through this system, independent companies could certify that the content of the issued certificates is accurate. In the case of Spain, the different regions that have implemented that control for Energy Certificates make it mandatory solely for those buildings that have obtained a score higher than a B.

10.8.6 Considerations about certificate's issuance process. Assessor's training, Register and Quality control

Just as with the EPC certifiers, the SRI certifier will have to undergo a capacitation process, or to have an enabling qualification. TO do so, certain training courses ought to be implemented. These courses would enable technicians to acquire the necessary abilities to issue the SRI certificates, or to demonstrate the lack of need of doing them due to having the necessary experience or professional qualification to issue the certificate.

The certifying technicians should be the one in charge of registering the certificate, to guarantee the process' traceability. This registration can be made both from the certifying application or entering directly the register that will be enabled for that purpose.

Just as it happens in certain regions of Spain, the certificates registered with the highest scores will have to undergo an external control, to validate the obtained results. To do so, the external control will analyse the entry data, and will inspect the assessed building, to guarantee the veracity of the information shown on the certificate.

10.8.7 Differences between auto certified, second party certificates and third party certificates, and differences between BREEAM and LEED concerning the issuance of certificates

- ✓ **AUTO CERTIFIED OR FIRST PARTY CERTIFICATE:** The self-certification process is the fastest, easiest and most economical system for issuing a certificate. The process must be regulated by a European directive, and as long as said directive allows it, a self-certification can be issued, as long as a competent third party is not required to carry out the conformity assessment work.
 - Preparation of the procedure: in this case, the procedure or reference for issuing the certified car will be defined by a European directive, or by each of the member states.
 - Training of auditors: The European Directive itself will define whether SRI auditors must have a professional qualification, or a minimum training to be able to issue the certificates, and what this training must be. In the case of EPC certificates, France or Portugal have implemented mandatory training courses for technicians who want to issue energy certificates, and in the case of Spain it is enough to have an academic qualification that qualifies them to issue said certificates.
 - Data collection: Data collection can be carried out by the owner, manager or operator of the building, any person with basic knowledge commissioned by them, or by an accredited technician or with the necessary training to be able to do so.
 - Issuance of the certificate: The self-certificate may be issued by the owner, manager or operator of the building, or the accredited technician.
 - Registration of the certificate: The registration of the certificate must be done by the owner, manager or operator of the building, and said certificate must be signed by the owner or by the accredited technician, as established in the European Directive, or in the regulations of each country.
 - Quality assurance: The managing body of each country can establish the criteria to establish the inspections or audits necessary to guarantee the quality assurance of self-certified products.
 - Conflict of interest: in the case of self-certificates there is a clear conflict of interest, since the beneficiary of the certificate is in charge of issuing it.
- ✓ **Second party certificates:** The own certifying committee is the one that issues the certificates, and, to do so, it relies on a series of accredited technicians, that are the ones who contribute the information of the building undergoing assessment. This is the system used by LEED. The technical assessor analyses the buildings, issues a report with the aspects that, according to the LEED procedure, have to be analysed, and the own certifying committee (LEED) issues the certificate with the score obtained, from the assessor's report. If the certifying committee needs additional information, it asks the technical assessor.

The technical assessor has to be accredited by the certifying organism, so there is a bigger control over the whole process.

- Preparation of the procedure: The certifying body (commission) itself is in charge of developing the certification procedures. In the case of LEED certification, it is the Green Building Council itself that is responsible for developing and maintaining the procedures for LEED certification.
- Training of auditors: The commission itself establishes the accreditation criteria for technicians and companies, and is responsible for their accreditation to be able to issue status reports, having control over the professionals who issue said reports. In the case of LEED certification, to obtain the LEED Green Associate certificate it is necessary to take a course, taught by specific agents in training LEED certification professionals, and then pass an exam before the US Green Building Council.
- Data collection: Data collection is carried out by accredited technicians or companies, based on what is established in the procedure, with a visit to the building by the accredited professional being mandatory.
- Issuance of the certificate: The certificate is issued by the certifying committee itself, based on the reports provided by the accredited technicians. In the case of LEED certification, the certificate is issued by the GBC.
- Registration of the certificate: The registration of the certificate is carried out by the committee itself. Thus, in the case of LEED certification, the GBC.
- Quality assurance: The committee itself is in charge of carrying out quality assurance through periodic audits of accredited technicians, and through interim control mechanisms.
- Conflict of interest: in the case of second-party certificates, there is no type of conflict of interest, as the committee itself issues the certificates.

- ✓ **Third party certificates:** The certifying committee accredits enterprises to issue the certificate, reserving themselves the right to execute quality control periodical audits to guarantee the transparency and impartiality of the process. This is the scheme followed by BREEAM.

✓

The own accredited enterprises are the ones issuing the certificates, based on a referential or certification procedure approved by the organism (BREEAM).

Preparation of the procedure: As for second-party certificates, the certifying body (commission) itself is in charge of developing the certification procedures.

- Training of auditors: The commission itself establishes the accreditation criteria for technicians and companies, and is in charge of their accreditation to be able to issue certificates, having control over the professionals who issue said certificates.
 - Data collection: Data collection is carried out by accredited technicians or companies, based on what is established in the procedure, with a visit to the building by the accredited professional being mandatory.
 - Issuance of the certificate: The certificate is issued by accredited companies or technicians, under the supervision and control of the accreditation body.
 - Certificate registration: Certificate registration is carried out by accredited companies or technicians.
 - Quality assurance: The committee itself is in charge of carrying out quality assurance through periodic audits of accredited technicians.
 - Conflict of interest: in the case of third-party certificates there are incompatibilities and conflicts of interest, and accredited companies or technicians cannot intervene in other certification processes that are incompatible. In the case of the SRI certificate, a possible conflict of interest could be having provided any type of advice for the implementation of intelligent systems in the building to be SRI certified.
- ✓ **Mixed certification system:** Once the evaluation procedure is established by the commission, any accredited entity or technician may prepare a report on the state of the building and issue the corresponding SRI certificate, but the commission that created the reference guide, or the public administrations, will be in charge of registration
- Preparation of the procedure: As for second and third party certificates, the certifying body (commission) itself is in charge of developing the certification procedures.

- Training of auditors: The commission itself establishes the accreditation criteria for technicians and companies, and is in charge of their accreditation to be able to issue certificates, having control over the professionals who issue said certificates.
- Data collection: Data collection is carried out by accredited technicians or companies, based on what is established in the procedure, with a visit to the building by the accredited professional being mandatory.
- Issuance of the certificate: The certificate is issued by accredited companies or technicians, under the supervision and control of the accreditation body.
- Registration of the certificate: The registration of the certificate is carried out by the committee itself.
- Quality assurance: The committee itself is in charge of carrying out quality assurance through periodic audits of accredited technicians.
- Conflict of interest: in the case of mixed certificates there are incompatibilities and conflicts of interest, and accredited companies or technicians cannot intervene in other certification processes that are incompatible. In the case of the SRI certificate, a possible conflict of interest could be having provided any type of advice for the implementation of intelligent systems in the building to be SRI certified.

11 Interaction with other building performance assessment schemes

This section considers the potential implementation of the SRI in conjunction with other assessment schemes. Specifically, it addresses:

- Possible coupling of the SRI scheme to existing schemes
- Interoperability to allow data exchanges from and to the SRI scheme (e.g. introduction of energy balance data from energy performance certificates to define domain weighting factors in the SRI; e.g. usage data from SRI assessment to inform an energy performance certificate on energy savings attributed to a smart thermostat in a particular building, etc.)
- Potential information provision on the **SRI-related capabilities of technical building systems** (e.g. through labelling, online datasets with up-to-date specifications, use of SRI references in marketing, etc.).

The text in this section draws directly upon that provided in the report Provisional Guidance on the Implementation of the SRI²⁷ written by Paul Waide of WSEE (lead author of the current Task 3.1 report) and is reprised here to familiarise the easySRI project team with the issues it covers on SRI assessment.

11.1 Potential coupling of the SRI scheme to existing schemes

There are a considerable number of existing building assessment schemes that the SRI could be connected with and implemented with conjointly. In principle, making such connections will enable the exploitation of synergies with regards to:

- Recruitment of building users wishing their buildings to be assessed
- Access to buildings and sharing of assessment costs
- Assessor training, qualification and certification
- Leveraged value for users
- Leveraged scheme recognition and brand building

²⁷ *Provisional Guidance on the Implementation of the SRI*, Paul Waide et al, 2021; <https://circabc.europa.eu/ui/group/54384127-eb1d-445e-9b6e-ef5ef14fe429/library/0666bbb4-b88a-4063-b55e-82faf62fa738/details>

- Leveraged communication and awareness raising.

The most important schemes to consider establishing such connections to are those which are already implemented by Member States themselves and particularly the schemes for the issuance of energy performance certificates and the periodic inspection of heating and cooling systems. In both cases, Member States may wish to offer an SRI assessment as a voluntary option or (once a test phase has been successfully demonstrated) to consider making the SRI mandatory within their jurisdictions.

If the SRI were to be coupled with an existing mandatory scheme then the option (or requirement) to have an SRI assessment would immediately be offered to a large number of building owners and hence the exposure to the SRI would be greatly increased compared to a case where the SRI is purely a standalone optional tool. The expected impact of the SRI at the EU-level was assessed in the 2nd technical assistance study¹⁴ for a variety of implementation cases and the option where it was integrated into the implementation of EPCs was found to have the largest impact. Thus, it is recommended that this option be examined in the SRI test phase and if confirmed to be viable to be considered as the basis for national adoption.

Currently, Member States might organise on-site inspections for any of the following reasons:

1. to issue an EPC
2. to conduct a heating system inspection in accordance with Article 14 of the EPBD (required for systems >70kW)
3. to conduct an air conditioning system inspection in accordance with Article 15 of the EPBD (required for systems >70kW)
4. to conduct a combined HVAC system inspection (potentially including ventilation) in accordance with Articles 14 and 15 of the EPBD
5. as-built checks for permits to use
6. for safety compliance checks of a heating system
7. for building and ventilation system air leakage tests
8. for F-gas compliance checks for a heat pump or AC system
9. for Ecodesign/ELR market surveillance checks for the energy labels applied for space heating systems and domestic hot water systems.

Only the first seven of these are likely to be done systematically and even here the practice (including the building/technical domain types in scope, the frequency of inspections and the nature of the party checking conformity) varies by Member State or even within them. Nonetheless, all Member State issue EPCs, all have heating and AC system inspections (at least for systems of >70kW), all are thought to require some kind of heating system safety conformity check and many are believed to require air leakage testing. In principle, any of these inspection processes could be adapted to include/encompass SRI assessments.

Evidently, several of these other sources of on-site inspection only entail inspection of certain technical building systems (TBS) (space-heating, space-cooling and combined HVAC inspections; heating systems safety checks; air-leakage tests; F-gas checks), while those for built permit checks and EPCs are tied to the permitting and EPC issuance processes respectively. Both factors (technical scope and timing) would affect their potential suitability for linkage with SRI assessment.

In addition, the skills required by the assessor also need to be taken into account. A priori, it is assumed that if an assessor is conducting energy performance checks for a TBS, such as is the case for heating and space cooling inspections, then they would already have many of the requisite skills and experience necessary to conduct SRI assessments, and would only require a relatively modest amount of additional training. As AC and ventilation systems are often related then a modest additional training might be needed to broaden the scope of AC system inspectors to cover ventilation TBS requirements. With more training it is not unreasonable to imagine an AC system inspector could be qualified to do heating system conformity checks too. In theory, the same process could apply for heating system inspectors although the additional training might need to be more extensive and protracted. Some countries, for example Germany, already employ the inspectors who are

responsible for conducting heating system safety checks to conduct heating energy performance checks. It is equally conceivable that an inspector used for market surveillance of packaged energy labels for space and water heating systems could relatively easily acquire the skillsets necessary to conduct inspections for such systems. In the case of F-gas and space cooling system inspections it is already frequent for these to be combined (i.e. such that the F-gas inspection occurs at the same time as the AC inspection) and hence there is no extra opportunity to combine with TBS inspections than for the AC inspection case already discussed) it would probably require a more extensive upskilling process to use F-gas inspectors (who are only doing that currently) for AC inspections.

In the case of EPC inspectors the applicability of their skill sets may depend on the type of building (e.g. residential or non-residential or both) they are qualified to verify EPCs for and the rigour of the EPC assessments currently required in the Member State in question. In principle, though EPC inspectors could be readily trained to also conduct TBS conformity verification checks and the software tools the inspectors (may) already apply to determine EPC compliance used to check system level performance conformity assessments for TBS. Obviously, the issue of the frequency/timing of EPC issuance compared to the moment a TBS conformity assessment declaration is made would need to be factored into the viability assessment as if an EPC is not issued until many years after a TBS is installed it can complicate the process of seeking remedial action from a contractor responsible for a non-compliant installation; however, viewed en masse linkage of TBS conformity verification with EPC inspections could offer an attractive synergy. The same could be true of linkage with as-built permitting inspections but these are only generally applicable to new build or major renovations building stages and hence would only capture a sub-set of the TBS installations subject to Article 8(1) requirements.

11.2 Interoperability

The issue of interoperability was discussed in section 9.2.2 wherein it was noted that some existing building performance certification schemes already entail formal explicit assessments of building interoperability and when such information is available and produced by a credible and recognised source Member States could opt to include it within the information provided on the certificate.

11.3 Potential information provision on the SRI-related capabilities of technical building systems

In the medium to longer term SRI assessment will be facilitated if the information on the SRI functionality of technical domains is declared when technical building systems (and technical domains in general) are installed. In principle it would also be facilitated if such declarations were made when a component of a technical domain is replaced and/or when a technical building system is inspected. Member States should therefore consider whether they will aim to encourage such practice either through setting requirements on the specifiers/installers of technical building systems and/or through those responsible for their inspection. In particular, Member States could require technical building system SRI functionalities to be assessed and declared when a system is newly installed or replaced. This would not only facilitate SRI assessment but would help promote awareness of technical system smartness functionality by placing an obligation on specifiers and installers to determine and declare smartness functionality to the procurers. This in turn would help to integrate the SRI functionality into the promotional material provided by the suppliers and create increased awareness of the value proposition within the market.

In principle, information about the extent to which specific technical equipment provide any given SRI functionality level could also be provided by the equipment suppliers. Providing there is a high degree of commonality in the functionality levels applied across the EU it will be relatively straightforward for equipment suppliers to provide the information in a common manner across the Single Market as a whole. This in turn, will facilitate the determination of the SRI functionality level provided to the equipment procurer by the specifier/installer.

There are likely to be many practical issues to address before any requirement to provide such information could be made compulsory, thus, a staged approach is likely to work best. Initially, training could be provided to a cadre of installers, via (for example) professional associations, to familiarise them with the SRI functionality levels applicable to their technical domain and to clarify how such functionality is to be determined for conformity assessment declarations. This could then be trialled in a voluntary pilot scheme, which might provide incentives for early adopters. If found to be successful it could be progressively scaled-up by providing incentives over a larger part of the market. Ultimately, once a sufficiently large part of the installer base has acquired the requisite skills the provision of the SRI functionality information could be made mandatory, perhaps phased in progressively for different segments of the market.

There will be much to be learned from sharing experience in this type of action with other Member States and even in coordinated actions to help build critical mass in the market. This is the type of measure that could be discussed by Member States in a collaborative manner within Working Group 1 of the SRI Platform.

12 Maintenance of the SRI methodology

The text in this section draws upon that provided in the report Provisional Guidance on the Implementation of the SRI²⁸ written by Paul Waide of WSEE (lead author of the current Task 3.1 report). The text here is updated to reflect the intervening developments. The aim is to familiarise the easySRI project team with the issues it covers on the maintenance of the SRI methodology so the easySRI calculation tool and wizard tool can be structured to be able to accommodate likely future changes.

12.1 Process to review the methodology

- The SRI's methodology is based on cataloguing functions and awarding a maximum score if the maximum functionality that is currently attainable is achieved. As the highest smart functionalities obtainable are contingent on the smart service offer the methodology inherently needs to be reviewed and updated in response to technological development. As new, higher functionalities become available they will need to be documented and the scoring system adjusted to reflect their existence. In addition, the current catalogue of services is not fully comprehensive. Some services were not included in the original methodology because the means of assessing their functionality was not sufficiently mature at the time to have confidence in how they should be scored. Some were not included because the added value of their inclusion was not considered to be sufficient to justify the extra assessment effort that would be needed. This process is fully documented in the 2nd technical assistance study¹⁴ but inevitably it represents a compromise between many factors and the rationale behind this compromise could evolve with smart service offers and policy priorities.
- Accordingly, it is necessary to establish a process to review and maintain, adapt or amend the SRI methodologies, both at the common EU-wide level and at the MS-specific level. At the European level this process was provisionally envisaged to be scrutinised through Working Group 2 of the SRI Platform. This working group was charged with consideration of the maintenance and possible extension of the SRI working methodology. The SRI platform contributes to the promotion of the SRI and related best practices. It acts as an exchange forum involving all stakeholders interested in the SRI, and a forward-looking discussion hub for technical, regulatory and implementation aspects of the SRI. In its first articulation the SRI platform was supported by three working groups which focus on specific elements of the SRI – the other two working groups were Working Group 1 on *Member State SRI test phase* and Working Group 3 on *The SRI value proposition and supporting measures*. The scope of each working group and the terms of reference for participation were introduced during the first plenary meeting of the SRI platform held on

²⁸ *Provisional Guidance on the Implementation of the SRI*, Paul Waide et al, 2021; <https://circabc.europa.eu/ui/group/54384127-eb1d-445e-9b6e-ef5ef14fe429/library/0666bbb4-b88a-4063-b55e-82faf62fa738/details>

December 16th 2021.²⁹ The first SRI Platform came to an end with the conclusion of the last SRI technical support contract in Q2 of 2023. Since then a new support contract has been issued and is being conducted by a team from VITO, WSEE and R2M. Under this the SRI Platform is being reprised but is expected to undergo some modifications which will be publicly announced in March 2024. Thus, the next iteration of this report will include an update on how the Platform will support the review and update of the SRI's methodology

- While the process outlined above will manage the generic EU-level methodology individual Member States may also wish to conduct a complementary process at their jurisdictional level. This could be especially important if any significant adaptations have been made to the generic EU level methodology. In doing so it will be important to allocate adequate independent technical resources to conduct and manage the activity.
- Critically, the easySRI calculation and wizard tools need to be structured in such a manner that they can accommodate such evolution in the SRI's methodology and assessment.

12.2 Maintenance of the MS service catalogues

For reasons that have been explained above it is expected that the SRI calculation methodology will evolve over time. This will allow higher future functionalities to be accounted for, the potential addition of new services and improvements in the assessment method to be included in future versions of the SRI.

In partial anticipation of this, the SRI delegated regulation^{2,3} specifications for the SRI certificate stipulate that it is mandatory for the certificate to include:

- (a) unique ID of the certificate
- (b) date of issue and date of expiry of the certificate
- (m) an informational text clarifying that the certificate reflects the smart readiness at the date of issuance and that any significant modifications to the building and its systems would affect smart readiness and would therefore require an update of the information given on the certificate.

Each of these aspects will help to ensure that it is clear that the certificate information and related scores are unique to when the assessment was conducted and the certificate issued and are only valid within a certain period and until such point as amendments are made to the building and its technical systems. The requirement to include an expiry date for the certificate should help to mitigate problems that could occur in the comparability of scores from one certificate to another due to periodic upgrades in the SRI calculation methodology.

However, these aspects alone may not be sufficient to avoid confusion in the market as a change in the methodology could occur before the expiry of a certificate issued under the previous methodology and thus the same building could receive different SRI scores (under the old and new methodologies) without having changed any of the functional characteristics of its technical systems. This problem has occurred in numerous asset or product performance rating schemes (e.g. EPCs, building sustainability certification schemes, energy labels, Eco labels and Energy Star) and the standard means of addressing it is to indicate the version number of the assessment methodology on the certificate. As the SRI assessment methodology is new and currently there is no history of SRI methodological changes the first version could be denoted as SRI methodology version 1 circa 2021. This information could be optionally conveyed in the certificates. Once future changes occur³⁰ they could be denoted as version X, circa 2XXX etc. and this makes it clear to users that the scores on the certificate can only be directly compared to assessment scores made with the same assessment methodology.

RECOMMENDATION: Considering these factors it is recommended that in addition to the certificate including a unique ID and a date of issue and date of expiry of the certificate (as specified under Annex IX of the delegated

²⁹ Recording, presentations and report of the event are available at https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/stakeholders-events-and-news_en

³⁰ Working Group 2 of the SRI Platform is charged with considering any need to update the SRI methodology.

regulation^{6,7}), that Member States also consider adding a methodology version number. Accordingly, the easySRI wizard tool certification support functionality will need to be designed to be capable of managing this.

13 Emerging findings from MS test phases

At the time of writing Member State test phases are being conducted in

- Austria
- Croatia
- Czech Republic
- Denmark
- Finland
- France
- Slovenia
- Spain

The publicly known details of these are summarised per Member State below. In addition, several other Member States are thought to be near to launching test phases or are considering them. In addition, several LIFE projects are also supporting SRI activities in specific Member States – the details of these are summarised after the short test phase summaries below. At the time of writing there is only limited information in the public domain on the MS test phases; however, this is expected to change in the coming months and this section of the report will be updated in the course of the easySRI project as more information becomes available.

13.1 Austria

The Austrian test phase is led by the Austrian Institute of Construction Engineering (OIB) and the Austrian Climate Ministry (BMK), with the involvement of AEE Intec and of the University of Natural Resources and Life Sciences Vienna (BOKU) who are conducting the assessments. The focus of the test phase is to benchmark the SRI methodology against other methods developed in Austria with a focus on energy flexibility. A large number of different building typologies are examined and assessed on the basis of detailed documented buildings from Austrian regions or the federal government.

13.2 Croatia

The SRI test phase in Croatia is led by the Ministry of Physical Planning, Construction and State Assets and is supported by the non-profit scientific institution Energy Institute Hrvoje Pozar (EIHP). The test phase will be conducted thanks to a recently selected project of the EU Programme for the Environment and Climate Action (LIFE). The test phase aims at exploring the potentials and opportunities for SRI in the Croatian context and at contributing to the overall development and refinement of the SRI calculation methodology.

13.3 Czech Republic

The Czech test phase is led by the Ministry of Industry and Trade (MPO), with support from the Department of Environmental and Building Services Engineering of the Czech Technical University in Prague (CTU). During the test phase the common SRI methodology is applied, and depending on the sensitivity of the results, some adaptations may be undertaken in a later phase. SRI evaluations are conducted by the team of the University. The test phase should last around one year.

13.4 Denmark

The Danish test phase is led by the Danish Energy Agency (DEA) in cooperation with the Danish Technological Institute (DTI). The purpose is to investigate potentials and opportunities for the SRI in a Danish context.

Assessors from DTI will conduct the SRI assessment for 25-30 buildings, including offices, dwellings, multi-family homes, educational institutions – old and new, and with different energy supplies.

13.5 Finland

The SRI test phase in Finland is led by the Ministry of the Environment with the support of MOTIVA, a company dedicated to promoting and supporting sustainable development. External assessors are going to be trained in order to conduct SRI assessments for a target of 150 buildings of different types. The test phase should last around two years, comprising a social impact assessment and an evaluation of the suitability of the scheme to Finland.

13.6 France

The French test phase is led by the Ministry for Ecological Transition with the support of CEREMA. SRI assessments are going to be conducted by independent third parties: EPC assessors are going to be recruited and trained for that purpose by CEREMA, who will in turn deliver formal SRI certificates. The target is to assess at least 30 buildings as a first step.

13.7 Slovenia

The SRI test phase in Slovenia is led by the Ministry for Environment, Climate and Energy with the support of Jožef Stefan Institute (Energy Efficiency Centre) and Goriška Local Energy Agency, in cooperation with the Horizon 2020 project TIMEPAC. A sample of at least 50 representative buildings will be assessed, covering different typologies, ages and uses. Assessments will be conducted by personnel from Jožef Stefan Institute and Goriška Local Energy Agency, and by external assessors to be trained through dedicated workshops. The test phase should last two years.

13.8 Spain

The SRI test phase in Spain is led by the Ministry for the Ecological Transition and the Demographic Challenge with the support of CENER - National Renewable Energy Centre within the context of the LIFE project SRI2MARKET. The test phase will include training sessions for EPC assessors to become SRI experts, based on the SRI2MARKET e-learning platform and training programme. SRI assessments will be conducted on a sample of at least 50 buildings across Spain. The test phase should last for 21 months.

13.9 SRI LIFE projects

The LIFE Programme is the EU's funding instrument for the environment and climate action. As part of the 2021 calls from the LIFE Clean Energy Transition programme, four proposals aimed to support the successful uptake of the SRI have been selected. These projects started in the fourth quarter of 2022: they are bound to implement SRI supporting activities in full consistency and complementarity with the SRI policy implementation work, in particular thanks to the SRI platform:

- EasySRI - Improving and demonstrating the potential of SRI
- SRI2MARKET - Paving the way for the adoption of the SRI into national regulation and market
- SRI-ENACT - Co-creating Tools and Services for Smart Readiness Indicator Uptake
- Smart² - Smart Tools for Smart Buildings: Enhancing the intelligence of buildings in Europe

14 Potential for a future operational performance methodology

The current SRI methodology is based on a physical assessment of the smartness of the technical domains in a building (i.e. an asset assessment methodology) rather than a buildings actual measured smart performance (i.e. an operational rating). Inherently, this reliance on an asset functionality check is not very “smart” as it uses traditional assessment methods rather than intelligent IT related ones, and it determines smart readiness (the capability for smartness) rather than operational smartness (i.e. the functionality that is actually being achieved). The reasons for this are both pragmatic and legal. Ostensibly, when the SRI was being developed it was determined in the two technical support studies that there was no viable means for assessing building smartness at an operational level that would not necessitate a much more intensive and lengthy development process (and hence would considerably delay the roll out of an SRI scheme while it were to be developed). From a legal perspective, the mandate to develop the SRI in the 2018 edition of the EPBD is only concerned with determining how smart ready a building is and not the actual operational smartness it is currently attaining. In part, this was necessitated because some of the smart ready capabilities cited in the EPBD text, and especially that concerned with energy flexibility, are reliant on entities beyond the building (such as DSOs or TSOs) if they are to be made operational and the EPBD has no jurisdiction over such actors.

Nonetheless, the objective of an operational performance based SRI methodology, known as Methodology C, was examined in some depth by a voluntary task force set up to support the 2nd technical support study¹⁴. The report they issued is no longer available on line but entailed setting out the value proposition for an operational SRI methodology and a number of associated aspirations rather than a practical methodology that was already implementable. Thus, while the authors of the current report are not aware of any extant operational SRI methodology it is quite conceivable that there may be a future demand to derive one and/or a hybrid methodology that is part asset, part operational in nature. The motivation and rationale for doing this may be greater at Member State level than EU-wide level because MS have wider regulatory scope than the EPBD and hence other policy vehicles they can use to encourage joined up service delivery between buildings and utilities (for example). On the other hand the technical challenges in developing a viable operational methodology are considerable and are likely to take a very extensive research and consultative effort before a satisfactory approach could be derived. Thus, for now it is not expected that the easySRI tools will need to be designed to accommodate an operational methodology but should further relevant developments occur during the course of the easySRI project these will be reported in subsequent updates to this deliverable.

15 Conclusions and future work

This report has documented the SRI’s legal framework, its extant methodologies, the freedoms Member States have to adapt and design their own methodologies, functional capabilities that will be needed in the easySRI calculation tool, the assessment process, the certification process, the provision of other information, the interaction with other building performance assessment schemes, maintenance and evolution of the SRI methodology(ies), findings from MS test phases and the potential for a wholly different, operational methodology. In some cases ongoing developments are known to be occurring and when this is the case it is stated in the report with the intent of updating the text to accommodate the findings from these developments as they occur before the final version of this deliverable is due to be issued. Ostensibly though the following conclusions can already be made about the required capabilities of the easySRI calculation tool:

The easySRI calculation engine should allow:

- All the functionality in the EC’s default service catalogues (of which the latest is v4.5)
- The option of being updated to reflect future changes in the service catalogues
- The selection of method A or B
- The ability for MS to choose services they want within the existing domains
- The ability for MS to add services they want within the existing domains
- The ability for MS to add extra functionality levels within existing services
- The ability for MS to change the impact scores per service functionality level should they wish

- The ability for MS specified weightings to be applied for:
 - Climate (e.g. energy balance related)
 - Building type
 - Service relevance (e.g. zeroing out if not relevant as determined through the tirage process or a priori)

The easySRI calculation engine should report (at least) the:

- Overall SRI score
- Which class category the overall SRI score puts the building into (noting the while the numerical class boundaries are set in the delegated regulation the class names associated with these are specified at the Member State level)
- SRI scores for the 3 pillars (three key functionalities) in line with the weighting of impacts to pillars specified in the delegated regulation
- SRI scores aggregated for each impact criterion
- The matrix of SRI scores for each domain and impact criteria

In addition:

- It should also allow all user (MS) adaptations to be clearly transparent - ideally it would produce both the MS adapted results but also the results aligned to the EC's default Methods A or B
- It should also allow normalised weighting by functionality across the building (not just the 2 levels permitted in the EC's default service catalogue v4.5) but any combination of levels making 100% for the given service)

Optionally, but preferably, it should allow:

- Linkage with energy balance data from EPCs (as an option, specified by the MS, to allow the energy balance weightings to be taken from the actual EPC data rather than the default climatic derived energy balance data – note MS would need to clearly specify the circumstances of when this should be done, and the easySRI should support the option of reporting the SRI scores both when calculated with the EPC energy balance data and with the default energy balance data)
- Whenever sufficient BACS functionality level data is available (see sections 4 and 5 for how/when the SRI functionality levels are aligned with the EN15232 BACS functionality levels) for the derivation of the building's BACS factor calcs per EN15232 or the ISO/EN update to it – the resulting BACS factor calculation results should be capable of being ported back into EPC software to allow an update of the EPC primary energy values based on the BACS factor corrections, this would (finally!) allow the contribution of BACS to be reflected in the EPC which is clear and glaring deficiency in current EPC energy performance calculations and a major additional value of the SRI (which mostly aligns to the EN15232 BACS functionality factors) – this option could either be directly incorporated into the easySRI calculation engine or added as a future extension; however, bringing it in now, should be quite straightforward to implement, and greatly increase the value added of an SRI assessment (by bringing control functionality into the EPC, which is currently missing yet makes a big difference to building energy performance – as a corollary to this, as many MS are expected to be implementing measures to require poorly EPC classed buildings to be upgraded to a higher class, the implementation of higher BACS functionality is one of the least invasive, cheapest and most readily implementable means of doing so that is recognized in the EPB calculation standards - so this is a major prospective value added for both the SRI, the EPCs (if recognized and integrated) and hence the easySRI calculation tool)
- Linkage with EPC calculation and reporting software, noting that the potential for standardized SRI assessment reports to be uploaded and linked with specific EPC data fields through automatic checks holds promise for enhancing the coexistence of these assessments
- Linkage with building logbook/BIM data and software
- Linkage with building Renovation Passports

Much information has also already been presented about the assessment and certification process and this also has significant implications for the functionalities and design of the easySRI wizard tool. Tasks 3.2 on Linkage of energy efficiency with the SRI, 3.3 on the Technical and Financial indicators for SRTs are also very pertinent for the functionalities and procedures needed for the wizard tool, so the intent is to bring all of the assembled information together into a coherent description of functionalities related to all these issues in the Task 3.4 report on easySRI implementation pathways for EU Member States. Nonetheless, it can already be

stated that as a priori the wizard tool should support the assessment process, it should also provide guidance to assessors (whether those charged with doing formal certification or simply those doing self assessment). Also the wizard tool will need to support examination and explanation of SRI results to users of the SRI in addition to other functionalities to be examined in Task 3.4. With regard to support of the certification process the wizard tool should be designed with the recommendations expressed in section 10 taken in mind.

16References

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- 9) 2018 revision of the EPBD - Amending Energy Performance of Buildings Directive (2018/844/EU) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.156.01.0075.01.ENG
- 10) The assessment package comprising a calculation sheet and a practical guide can be provided upon request by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.
- 11) The SRI framework Excel tool, can be requested as part of *the SRI assessment package* which is available upon request by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.
- 12) The details of this generic catalogue and how it was initially created are set out in the 2nd technical assistance study¹⁴. As mentioned above, an updated version, known as the SRI framework Excel tool, can be requested as part of *the SRI assessment package* which is available upon request by using this form: <https://ec.europa.eu/eusurvey/runner/SRI-assessment-package>.
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 - 18) The European Union Agency for Cybersecurity (ENISA) <https://www.enisa.europa.eu/>
 - 19) COMMISSION DELEGATED REGULATION (EU) .../... of 29.10.2021 supplementing Directive 2014/53/EU of the European Parliament and of the Council with regard to the application of the essential requirements referred to in Article 3(3), points (d), (e) and (f), of that Directive (Text with EEA relevance) https://ec.europa.eu/growth/system/files/2021-10/C_2021_7672_F1_COMMISSION_DELEGATED_REGULATION_EN_V10_P1_1428769.PDF

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