2nd recast of the EPBD - Energy, IEQ, smart buildings & digitalisation

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REHVA position paper on the European Commission proposal of the revised ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE COM(2016)0765

General remarks

REHVA supports and appreciates the principles of EPBD aiming both at the improvement of energy performance in new buildings with cost optimal minimum requirements, as well as at the improvement of energy performance in existing buildings with incentives. REHVA welcomes the binding 30% energy efficiency target of the revised EPBD and is confident that the building sector can and should contribute more to achieving it. While staying on track with highly ambitious nZEB targets for new buildings, **the EPBD must put more focus on the energy refurbishment of the existing building stock,** including the **replacement and upgrade of inefficient technical building systems that waste energy and don't deliver good indoor environment quality.** The revised EPBD shall better tackle this challenge and aim at **strengthening the implementation and its enforcement.**

Ensuring high indoor environment quality and energy efficiency at the same time

Health and comfort of consumers should be ensured and improved in all buildings, especially when implementing deep energy retrofit projects. To achieve this, REHVA advocates for indoor environment quality (IEQ) related requirements in the EPBD. REHVA welcomes that Annex I of the legislative proposal mandates Member states to ensure minimum environment quality levels. However, to provide and maintain good and healthy indoor climate, IEQ aspects should be further strengthened in the directive.

1. The revised EPBD should set a clear mandate for Member States to **define indoor environmental quality requirements that are monitored and reported in a harmonised way** in building regulations across Europe.
2. **IEQ criteria shall be part of the inspection** of heating and cooling systems, and continuously monitored alongside the energy performance of the buildings.
3. REHVA recommends developing an indoor environmental quality indicator to be used beside the primary energy indicator. This **IEQ indicator shall be reported in a transparent way in the energy performance certificates.** EPC-s shall provide information about indoor air quality (ventilation rate) and about the indoor thermal environment (summer and winter). This can be implemented based on the prEN 16798-1 standard (or its equivalent the ISO 17772-1), displaying in the EPC-s a reference to the IEQ categories as defined by the standard.
4. The **definition of technical building system** should be changed to: "Technical equipment and systems for heating, cooling, ventilation, humidification, dehumidification, domestic hot water, lighting, building automation and control and electricity production used to control **indoor environmental parameters** in a building." to cover also solar shading and daylight control, and air cleaning.

Ensuring quality, proper maintenance, and performance through mandatory inspection of heating, ventilation, and air-conditioning systems

The EPBD should address the quality of installed technical systems, including their regular maintenance, and support the replacement of the old equipment where appropriate. The inspection of technical building systems is of key importance in this process, because it can ensure quality, compliance with standards and building codes, as well as high energy performance. Therefore, the **EPBD shall maintain and improve Articles 14-15** on the inspection of heating and air-conditioning systems. Furthermore,

it is advisable to extend the scope **to ventilation and air-conditioning systems**, as these are often combined and ventilation has a significant impact on energy and IEQ. The original articles were poorly implemented as it was not clear how the outcomes were to be used or enforced. REHVA welcomes that the Commission aims at improving the current requirements. However, some important aspects are not clear or missing in the proposed new version, and the requirements on the alternative continuous monitoring and BAC are technically and practically too complex to be implemented and enforced. The issues to improve are detailed below.

1. Setting and measuring clearly defined target values in a transparent way

The primary intention of the EPBD is to cost-effectively improve the energy performance of buildings. This primary intention can be achieved by stating performance requirements, but the technical means of implementation should be let open and technology neutral. Then the market can find cost optimal solutions that is important for encouraging innovation and continuous development.

The **EPBD shall mandate Member States to set up and enforce a transparent inspection process with clearly defined criteria** ensuring the following points:

- The inspection must be based on a set of generally defined system parameter values (system temperatures, flowrates, schedules, specific fan powers, COPS etc.) for individual components and systems (e.g. boilers, air handling units, CHP, chillers, heating circuits etc.). Data for the testing must be provided by the systems (components, BAC, monitoring systems, etc.) for inspection according to minimum standard data criteria (scope, format) that each system has to provide.
- Energy use and power demands shall be reported at the level of the various technical building systems and occupant controlled non-EPB uses (small power, lighting, and process loads).
- The measured values, design specification and product data shall enable a transparent and explicit evaluation for detecting whether a specified performance is met or not. These tests must be carried out in a technical system independent from the BAC (because the BAC data may be wrong) by an independent third party.
- Based on the results of the above evaluation, the inspection should provide guidance on the potential energy savings possible.

2. Continuous monitoring, energy management, and building automation and control (BAC)

REHVA promotes continuous monitoring and the analysis of operational data to operate buildings in a cost-effective way using automated data input. However, the currently proposed requirements (paragraphs 2, points a-c in articles 14-15) mix the different competences and roles of proper operation and of the inspection process testing it. The **requirements as defined now are technically too complex and difficult to implement and to enforce by the regulatory framework.** Problems of the requirements a-c:

- "*(a) continuously monitoring, analysing and adjusting energy usage;*"
  BAC can support this function from a central place, but not implement the complete process. The adjustment is usually done by a system operator, who is largely responsible for the building performance (e.g. by setting schedules, set points and manual operation) and has therefore to be part of the inspections scope.
- "*(b) benchmarking the building's energy efficiency, detecting losses in efficiency of technical building systems, and informing the person responsible for the facilities or technical building management about opportunities for energy efficiency improvement;*"
  BAC and all the connected services are part of the same system and therefore responsible for the performance of the building. BAC can help in detecting losses, however benchmarking a buildings energy efficiency and identifying improvement opportunities requires understanding of wider context beyond simply the building services. An external service should verify the achieved benchmarked performance, referring to wider world benchmarks and possibilities.

  BAC systems are an important means of improving the energy efficiency of buildings, however, the performance of HVAC and BAC systems are highly sensitive to errors in design, construction, and operation. There are numerous examples of BAC systems not working as intended, as they are complex systems whose interaction with the buildings they serve are often not fully understood by their operators.

  Therefore, equally important as the systems themselves is the quality management for testing the systems performance. Third party testing through well-defined regular inspections or continuous monitoring shall be a mandatory requirement for buildings. This can ensure the closing of the gap between designed and actual energy performance.

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Main issues in 2nd recast of the EPBD

Provisionally agreed and sealed by the the third informal trilogue on 19 December 2017, expected to be published in April 2018

The latest political issues addressed:

- the content, development and implementation of the long-term renovation strategy;
- electro-mobility;
- the Smart Readiness Indicator;
- energy performance databases;
- the inspections and their alternatives;
- primary energy and weighting factors;

New EPBD items discussed in this presentation

1. Renovation strategy and NZEB performance

2. Ventilation, indoor air quality and comfort levels to be defined by MS

3. Smart readiness indicator and building automation

Long-term renovation strategy

- It is stated that Member States shall establish a long-term strategy facilitating the cost-effective **transformation of existing buildings into nearly-zero energy buildings**
- This includes setting out a roadmap with measures and domestically defined measurable progress indicators, with a view to the long-term 2050 goal of reducing greenhouse gas emissions in the Union by 80-95% compared to 1990
- The roadmap shall include indicative milestones for 2030, 2040 and 2050
- The strategy should cover:
  - policies and actions to stimulate cost-effective deep renovations
  - mobilisation of investments into the renovation

Technical challenge of nZEB performance levels

JRC 2016 data: Energy performance expressed by Member States

No consensus on NZEB EP-value

Country	Residential Buildings (kWh/m²/y or Energy Class)		Non-Residential Buildings (kWh/m²/y or Energy Class)	
	New	Existing	New	Existing
Austria	160	200	170	250
Belgium	45 (Brussels region) 30 (Flemish region) 60 (Walloon region)	~54	(95–2.5) *(V/S) (Brussels region) 40 (Flemish region) 60 (Walloon region)	~108
Bulgaria	~30–50	~40–60	~30–50	~40–60
Cyprus	100	100	125	125
Czech Republic	75%–80% PE	75%–80% PE	90% PE	90% PE
Germany	40% PE	55% PE	n/a	n/a
Denmark	20	20	25	25
Estonia	50 (detached house)	n/a n/a n/a n/a	100 (office buildings) 130 (hotels, restaurants) 120 (public buildings) 130 (shopping malls)	n/a n/a n/a n/a
	100 (apartment blocks)	n/a n/a n/a	90 (schools) 100 (day care centres) 270 (hospitals)	n/a n/a n/a
France	40–65	80 n/a	70 (offices without AC) 110 (offices with AC)	60% PE n/a
Croatia	33–41	n/a	n/a	n/a
Hungary	50–72	n/a	60–115	n/a
Ireland	45 (Energy load)	75–150	~60% PE	n/a
Italy	Class A1	Class A1	Class A1	Class A1
Latvia	95	95	95	95
Lithuania	Class A++	Class A++	Class A++	Class A++
Luxemburg	Class AAA	n/a	Class AAA	n/a
Malta	40	n/a	60	n/a
Netherlands	0	n/a	0	n/a
Poland	60–75	n/a	45–70–190	n/a
Romania	93–217	n/a	50–192	n/a
Spain	Class A	n/a	Class A	n/a
Sweden	30–75	n/a	30–105	n/a
Slovenia	45–50	70–90	70	100
Slovakia	32 (apartment buildings) 54 (family houses)	n/a n/a	60–96 (offices) 34 (schools)	n/a n/a
UK	~44	n/a	n/a	n/a

European Commission

RECOMMENDATIONS

COMMISSION RECOMMENDATION (EU) 2016/1318

of 29 July 2016

on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings

Joint Research Centre

European Commission

Appliances not included in offices

Appliances and lighting not included in single-family

NZEB level of energy performance	**Mediterranean** Zone 1: Catania (others: Athens, Larnaca, Luga, Seville, Palermo)	**Oceanic** Zone 4: Paris (others: Amsterdam, Berlin, Brussels, Copenhagen, Dublin, London, Macon, Nancy, Prague, Warszawa)	**Continental** Zone 3: Budapest (others: Bratislava, Ljubljana, Milan, Vienna)	**Nordic** Zone 5: Stockholm (Helsinki, Riga, Stockholm, Gdansk, Tovarene)
	Offices kWh/(m2/y)			
net primary energy	**20-30**	**40-55**	**40-55**	**55-70**
primary energy use	80-90	85-100	85-100	85-100
on-site RES sources	60	45	45	30
	New single family house kWh/(m2/y)			
net primary energy	**0-15**	**15-30**	**20-40**	**40-65**
primary energy use	50-65	50-65	50-70	65-90
on-site RES sources	50	35	30	25

EC recommendations and conclusions

- Set national definitions of NZEB at a high level of ambition – not below the **cost-optimal** level of minimum requirements (20/30 year LCC calculation for res/non-res).

  Use **renewables in an integrated design concept** to cover the low energy requirements. Assure proper indoor environment to avoid deterioration of **IAQ, comfort and health**.
- Most NZEB **definitions implemented** at national level.

  No consensus on different aspects (e.g. system boundaries, single /building unit, on-site production, energy efficiency level, inclusion of lighting, household electricity, RES).

→ cost optimality the major NZEB criterion/tool to solve inconsistency between national NZEB and EC recommendations

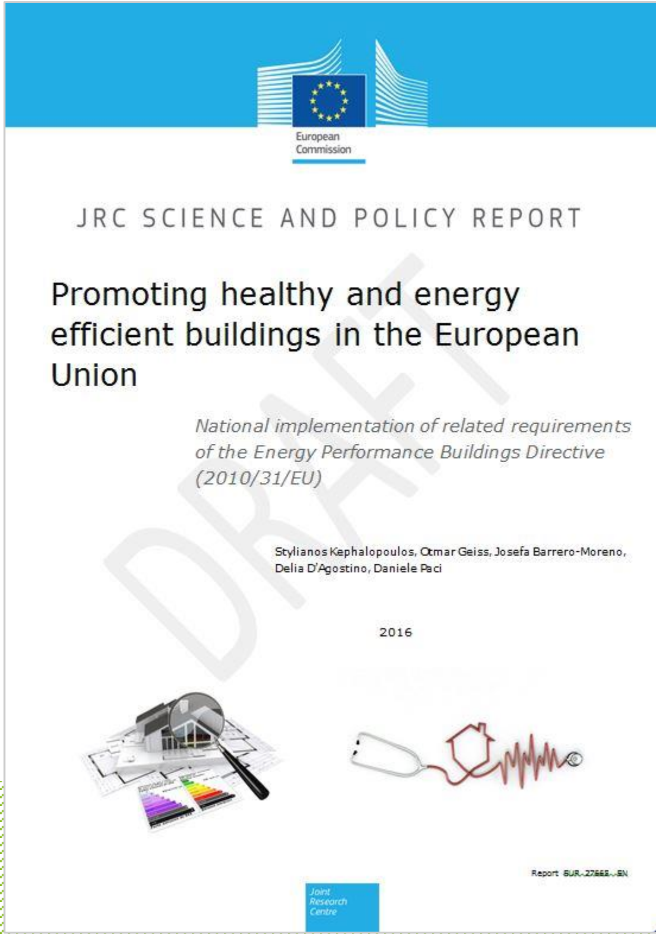
IEQ in new EPBD

Indoor Environmental Quality (IEQ) requirements in EU:

- Currently there are no binding ventilation and IEQ requirements at EU level
- From a regulatory point of view this remains under the competencies and responsibilities of the EU Member States

JRC assessment (2016) of the implementation status of the EPBD by the EU MS in terms of ventilation and indoor air quality criteria:

- Many inadequate ventilation problems reported from renovation
- New evidence that mechanical HR ventilation systems lead to an overall improvement of the IAQ and reduction of reported comfort and health related problems if properly designed and operated



Example of ventilation requirements (BPIE 2015)

- Ventilation is included in all surveyed EU MS building regulations but **minimum requirements are set only for half of the countries** while for the other half there are only recommended minimum ventilation rates

⇒ Is it possible to design and construct buildings without ventilation in EU?

⇒ No doubt that possible in renovation

Country and Standard Reference	Whole Building Ventilation Rates	Living Room	Bedroom	Kitchen	Bathroom + WC	WC only
Brussels (NBN D 50-001)	3.6 $m^3/(h·m^2)$ floor surface area	Minimum 75 m^3/h (limited to 150 m^3/h	Minimum 25m^3/h (limited to 72m^3/h)	Open kitchen Minimum 75 m^3/h (exhaust)	Minimum 50 m^3/hour (limited to 75 m^3/h	Minimum 25 m^3/h
Denmark (BR10)	Min. 0.3 $l/s·m^2$ (supply)	Min. 0.3 $l/(s·m^2)$ (supply)		20 l/s (exhaust)	15 l/s (exhaust)	10 l/s (exhaust)
France (Arrêté 24.03.82)	10-135 m^3/h (depending on room number and ventilation system)			Continuous: 20 – 45 m^3/h		Minimum 15 m^3/h
Germany (DIN 1946-6)	15-285 m^3/h (details see chapter)			45m^3/h (nominal exhaust flow)	45 m^3/h (nominal exhaust flow)	25 m^3/h (nominal exhaust flow)
Italy (Legislative Decree 192/2005, UNI EN 15251)	Naturally ventilated: 0.3 – 0.6 vol/h	0.011 m^3/s per person for an occupancy level of 0.04 persons/m^2			4 vol/h	
Poland (Art 149 (1) – Journal of Laws 2002 No. 75, item. 690, as amended and PN-B-03430:1983/ Az3:2000)	20 m^3/h for each permanent occupant should be calculated according to the Polish standard but not less than 20 m^3/h	20 -30 m^3/h for each permanent occupant (for public buildings) For flats, it is a summary of flow from all rooms		30 m^3/h to 70 m^3/h without windows	50 m^3/h	30 m^3/h
Sweden (BFS2014:13 – BBR21)	Supply: min 0.35 $l/(s·m^2)$ floor area					
UK (Approved Document F)	13-29 l/s (depending on bedrooms)			13-60 l/s (extract)	8-15 l/s (extract)	6 l/s (extract)
EN 15251	0.35 – 0.49 l/ $(s·m^2)$	0.6 – 1.4 $l/(s·m^2)$		14-28 l/s	10-20 l/s	7-14 l/s

Requirement Recommendation European standard

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EPBD ANNEX 1: ventilation, IAQ and comfort levels

- In EPBD Annex 1, new requirements are set:
  - “The energy needs for space heating, space cooling, domestic hot water, lighting, ventilation and other technical building systems shall be calculated in order **to optimise health, indoor air quality and comfort levels defined by Member States** at national or regional level”
- → clear mandate to MS to establish minimum ventilation and other IEQ requirements for new buildings and major renovations to implement the directive

Smart Readiness Indicator SRI

The 2nd EPBD recast is going to introduce a new indicator, the Smart Readiness Indicator (SRI)

"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"

Smart Readiness Indicator SRI

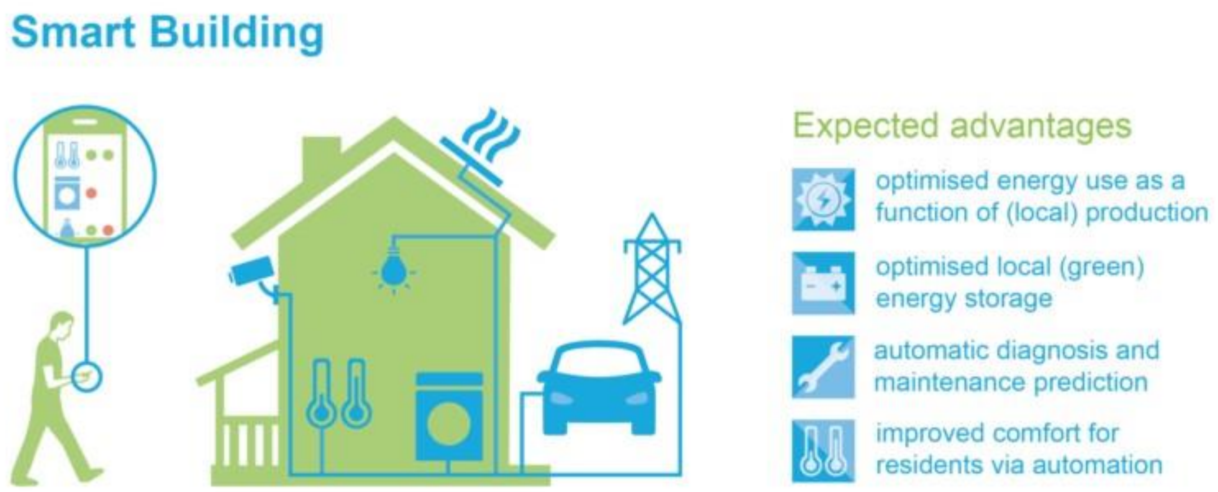
A delegated act will establish an optional common EU scheme for rating the smart readiness, that:

- define the building smart readiness indicator
- establish a methodology to calculate it

European Commission has commissioned a technical study to VITO, Waide Strategic Efficiency, Ecofys and OFFIS towards the development of a smart readiness indicator for buildings.

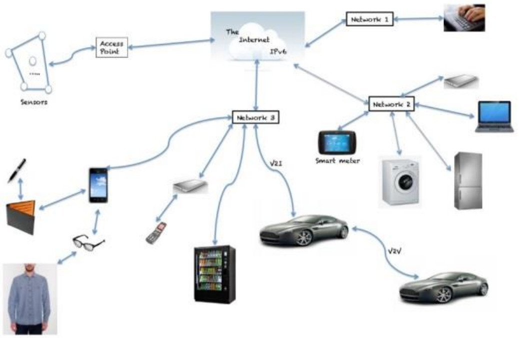
Smart Readiness Indicator SRI

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



Smart Readiness Indicator SRI

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



Smart Readiness Indicator SRI

The methodology shall rely on three key functionalities :

a) the ability to maintain energy efficiency 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 paying due attention to the availability of user-friendliness, maintaining healthy indoor climate conditions and 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.

SRI Indicator hierarchical structure

By VITO et alt. based on multi-criteria decision making method

SRI INDICATOR

↳ 11 DOMAINS — Same importance or weighted importance?

↳ SERVICES — Same importance or weighted importance? — each domain: 3 to 17

↳ FUNCTIONALITY LEVELS — each service: 2 to 5

Different importance given by the score

↳ IMPACT SCORES — 8 impact categories

Same importance or weighted importance?

SRI Domains

By VITO et alt.

- 11 Domains:
  - Heating
  - Domestic hot water
  - Cooling
  - Mechanical ventilation
  - Lighting
  - Dynamic building envelope
  - Energy generation
  - Demand side management
  - Electric vehicle charging
  - Monitoring and control
  - Various

Same importance or weighted importance?

SRI Services: ex. Heating Domain

Domain	Service	Sub-service	Description
Heating	**Heating-1**		**Heat control – demand side**
		Heating-1a	Heat emission control
		Heating-1b	Emission control for TABS (heating mode)
		Heating-1c	Control of distribution network hot water temperature (supply or return) - Similar function can be applied to the control of direct electric heating networks
		Heating-1d	Control of distribution pumps in networks
		Heating-1e	Intermittent control of emission and/or distribution - One controller can control different rooms/zones having same occupancy patterns
		Heating-1f	Thermal Energy Storage (TES) for building heating
		Heating-1g	Building preheating control
	Heating-2		**Control heat production facilities**
		Heating-2a	Heat generator control (combustion and district heating)
		Heating-2b	Heat generator control (heat pump)
		Heating-2c	Sequencing of different heat generators
		Heating-2d	Heat system control according to external signal (such as electricity tariff, gas pricing, load shedding signal etc.)
		Heating-2e	Heat recovery control (e.g. excess heat from data centers)

Same importance or weighted importance?

SRI Functionality Levels

- Functionality levels are ordinal numbers, implying that ranks cannot be compared in between distinct services.
- The number of functionality levels varies from service to service, the maximum level can be as low as 1 or as high as 5.
- A higher functionality level means “smarter” service

Functionality levels for Subservice Heat Emission Control - Heating-1a	
level 0	No automatic control
level 1	Central automatic control (e.g. central thermostat)
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)
level 3	Individual room control with communication between controllers and to BACS
level 4	Individual room control with communication and presence control

SRI Impact Categories

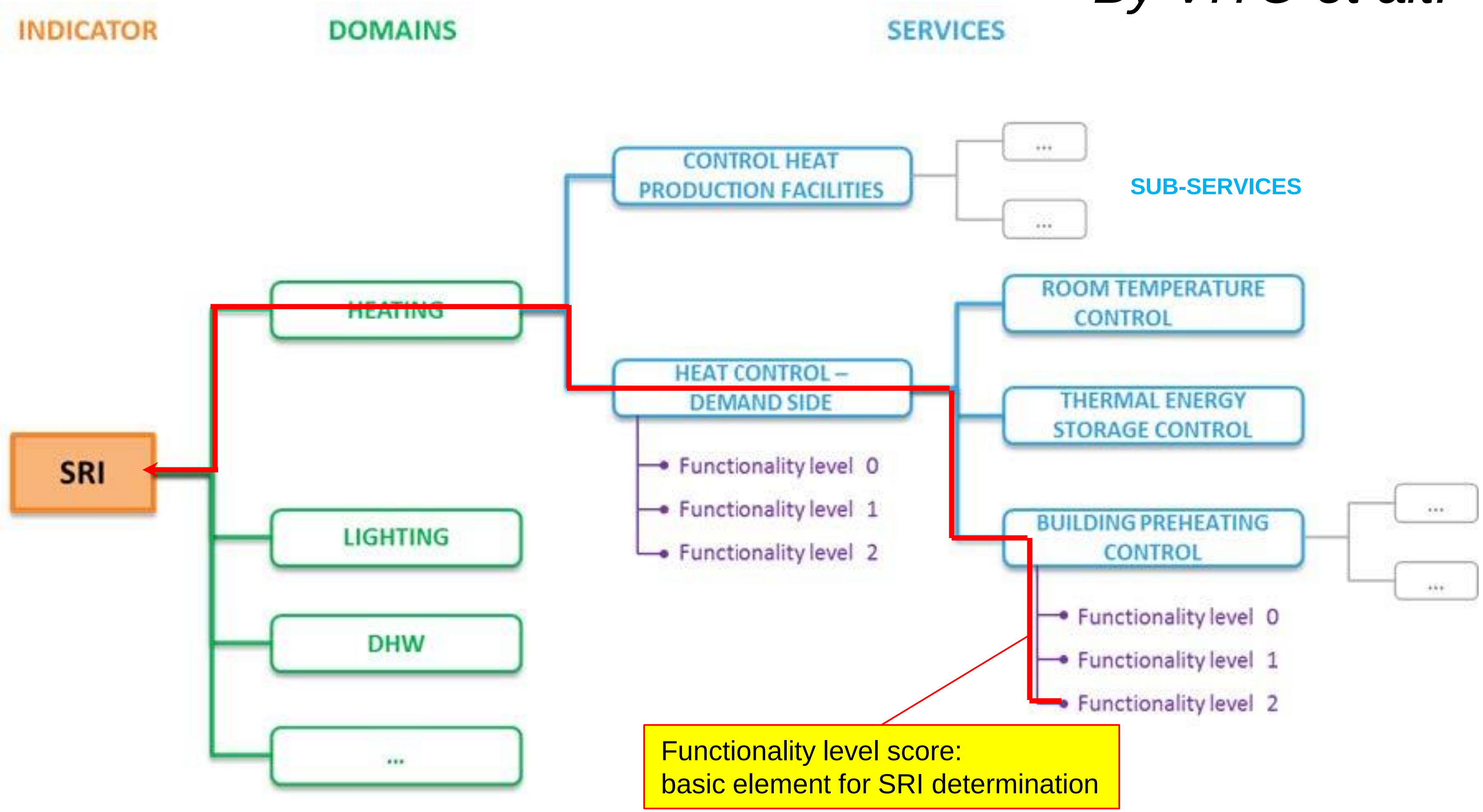
By VITO et alt.

- 8 Impact field
  - Energy savings on site
  - Flexibility for the grid and storage
  - Self generation
  - Comfort
  - Convenience
  - Health
  - Maintenance & fault prediction
  - Information to occupants

Same importance or weighted importance?

SRI Calculation Methodology

By VITO et alt.



Impact of a Functionality Level

By VITO et alt.

- Qualitative relation between Functionality Level of a Subservice and its Impact
- 9 levels cardinal scale : ----,---,--,-,0,+,++,+++,++++

code	service	Subservice?		
Heating-1a	**Heat emission control**	**yes**	If subservice: overarching service is:	**Heat control - demand side**

Functionality levels		IMPACTS							
		Energy savings on site	Flexibility for the grid and storage	Self generation	Comfort	Convenience	Health	maintenance & fault prediction	information to occupants
level 0	No automatic control	0	0	0	0	0	0	0	0
level 1	Central automatic control (e.g. central thermostat)	+	0	0	+	+	0	0	0
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)	++	0	0	++	++	0	0	0
level 3	Individual room control with communication between controllers and to BACS	++	0	0	++	+++	0	+	**0**
level 4	Individual room control with communication and presence control	+++	0	0	++	+++	0	+	**0**

Impact Scores

- Ordinal functionality level rankings mapped to nominal impact scores
- 9 qualitative values: ----,---,--,-,0,+,++,+++,++++
- 9 score values (cardinal numbers)

Ordinal ranking	Nominal impact score
++++	4
+++	3
++	2
+	1
0	0
-	-1
- -	-2
- - -	-3
- - - -	-4

Impact Scores of a Functionality Level of a Sub-service

- Qualitative relation between Functionality Level of a Subservice and its Impacts
- Score cardinal values, $SC_{I,D,SS,F}$ (I=impact, D=domain, SS=sub-service, Functionality level)

code	service	Subservice?		
Heating-1a	**Heat emission control**	**yes**	If subservice: overarching service is:	**Heat control - demand side**

Functionality levels		**IMPACTS**							
		Energy savings on site	Flexibility for the grid and storage	Self generation	Comfort	Convenience	Health	maintenance & fault prediction	information to occupants
level 0	No automatic control	0	0	0	0	0	0	0	0
level 1	Central automatic control (e.g. central thermostat)	**1**	0	0		**1**	0	0	0
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)	**2**	0	0	**2**	**2**	0	0	0
level 3	Individual room control with communication between controllers and to BACS	**3**	0	0	**2**	**3**	0	**1**	**0**
level 4	Individual room control with communication and presence control	**4**	0	0	**2**	**3**	0	**1**	0

Max Impacts Scores for each Sub-service

Domain	Service	Sub-service	Impacts Max Score Values							
			E.S.	Flex.	S.G.	Com.	Conv.	Health	M&FP	INFO
Heating	**Heating-1**		**2**	**0**	**0**	**2**	**2**	**0**	**0**	**0**
		Heating-1a	3	0	0	2	3	0	1	0
		Heating-1b	2	0	0	2	3	0	1	1
		Heating-1c	2	0	0	1	2	0	1	0
		Heating-1d	3	0	0	3	0	0	0	0
		Heating-1e	3	0	0	3	3	0	0	0
		Heating-1f	2	0	0	1	0	0	0	0
		Heating-1g	2	0	0	2	2	0	0	1
	Heating-2		**2**	**0**	**0**	**2**	**1**	**0**	**0**	**0**
		Heating-2a	2	0	0	2	0	0	0	0
		Heating-2b	2	1	0	2	0	0	0	0
		Heating-2c	1	1	0	0	0	0	0	0
		Heating-2d	2	1	0	1	1	0	0	0
		Heating-2e	3	0	0	0	0	0	0	0
	Subservices max scores sum		**27**	**3**	**0**	**19**	**14**	**0**	**3**	**2**

Impacts Scores Aggregation among Domains: weighting factors

An example for a Single Family House is given in VITO report, where the total number of possible domains are considered, i.e. N_D = 10, not the actual ones (i.e. no cooling ➔ N_D = 9)

Domain	Impact criterion							
	Energy savings on site	Flexibility for the grid and storage	Self generation	Comfort	Convenience	Health	maintenance & fault prediction	information to occupants
Heating	66	14	0	40	10	10	10	7
Domestic hot water	18	14	0	10	10	10	10	7
Cooling	4	14	0	15	10	10	10	7
Mechanical ventilation	3	0	0	10	10	10	10	7
Lighting	7	0	0	10	10	10	10	7
Dynamic building envelope	2	0	0	5	10	10	10	7
Energy generation	0	14	80	0	10	10	10	7
Demand side management	0	14	10	5	10	10	10	7
Electric vehicle charging	0	14	10	0	10	10	10	7
Monitoring and control	0	14	0	5	10	10	10	40
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

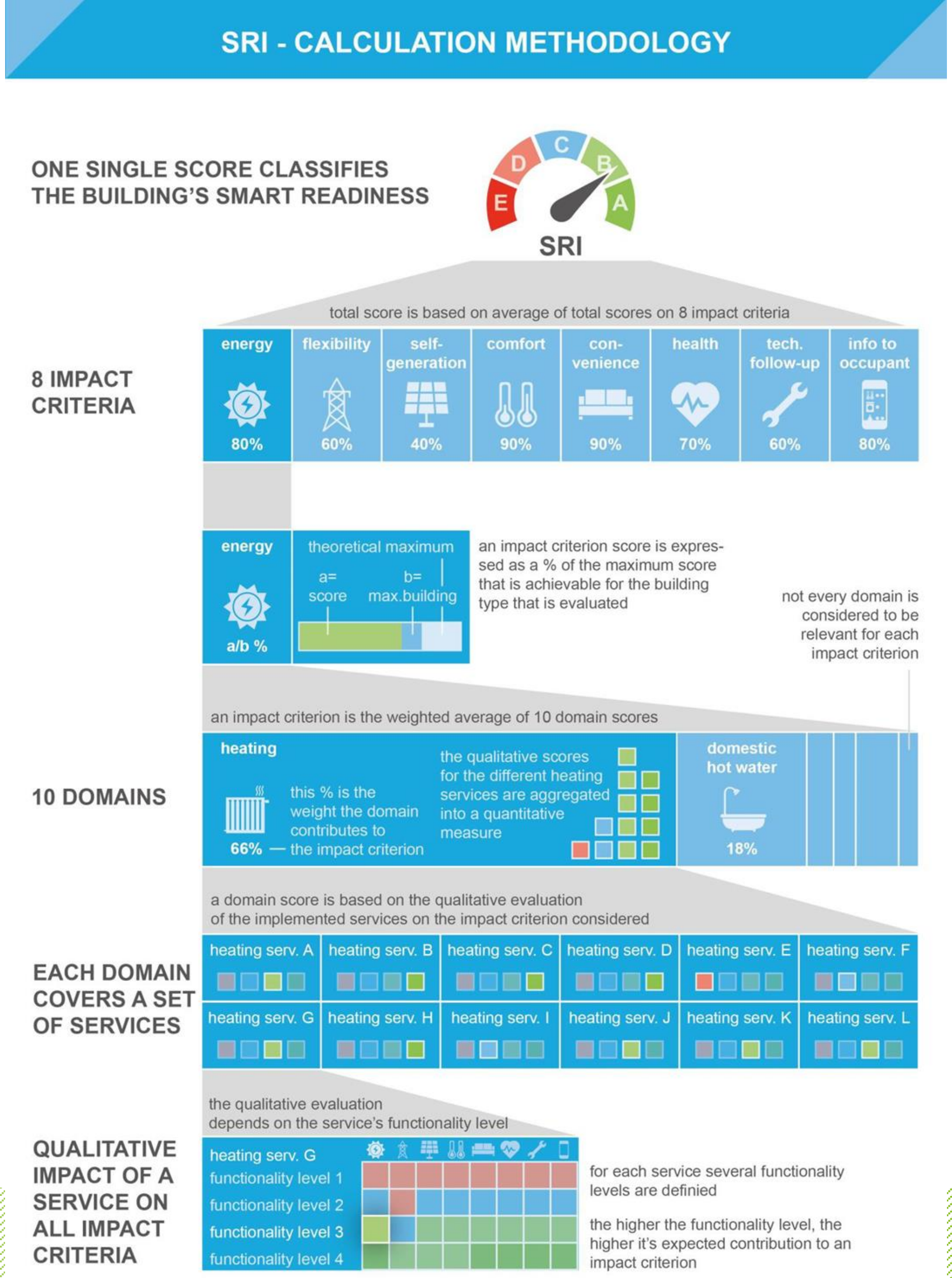
SRI Final Assessment

Based on multi-criteria decision making (MCDM) method (linear weighted method), *SRI* is then:

$$SRI = \frac{1}{N_I}\sum_{I=1}^{N_I} NSC_I \cdot w_I \leq 100 \quad ; \quad \sum_{I=1}^{N_I} w_I = 1$$

to have a final *smart readiness indicator SRI* between 0 and 100 for the building.
In this case, N_I = 8 always, because all impacts have to be evaluated.

Method Overview



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Weak points to be addressed

- Qualitative assessment of scores for almost all functionalities:
  - reference is made to EPBD standards, as EN15232 for BACS, but in an useless way: no any performance based scale is given; ➔ **TOO MUCH SUBJECTIVE**
- The multi-criteria decision making (MCDM) method is based on weights at different levels:
  - to provide significant weighting coefficients a public enquire among buildings energy experts more than politicians has to be carried out;
  - this can be at the National level or at the European Level.

Weak points to be addressed

- The multi-criteria decision making (MCDM) method is based on weights:
  1. among sub-services for each domain (assumed all the same in the VITO report);
  2. among domains for each impacts (an example of weighting coefficients is given in the VITO report);
  3. among impacts (assumed all the same in the VITO report)

All these 3 points must be defined on the basis of National or European enquiring.