The possibilities for labelling of smart buildings

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Content

- Directive (EU) 218/844: Revised EPBD (19. June 2018)
- Smart buildings' features
- LEED, BREEAM and WELL certification systems from smart building point of view
- Smart Readiness Indicator, SRI

Revised EPBD - 19. June 2018

- Directive (EU) 218/844 amending Directive 2010/31/EU (EPBD)

- Two of the main objectives of the revised EPBD are:

  1. Encourages the use of **information and communication technology (ICT) and smart technologies** to ensure buildings operate efficiently (eg. introducing automation and control systems).

  2. Introduces a **Smart Readiness Indicator (SRI)**, which will measure the buildings' capacity to use new technologies and electronic systems to adapt to the needs of the consumer, optimise its operation and interact with the grid.

- The European Commission shall adopt a delegated act by establishing an optional common Union scheme for rating the smart readiness of buildings by 31 December 2019.
- In Annex IA of the revised EPBD a common general framework for rating the smart readiness of buildings is shown. The **SRI 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,
  - benefits for the indoor climate condition, energy efficiency, performance levels and enabled flexibility.

- The upcoming act will establish the definition of smart building.

- Currently, the **definition of smart building** can be determined only indirectly from the revised **EPBD:**

Smart building is such a building, which adapt the operation to the needs of the occupants (e.g. control of HVAC and lighting systems), and to the grid (e.g. demand response, smart meter), and use information and communication technologies and electronic systems (e.g. building management system accessible via the internet).

SMART BUILDING

- Building envelope
- HVAC
- Informatics
- Energy management

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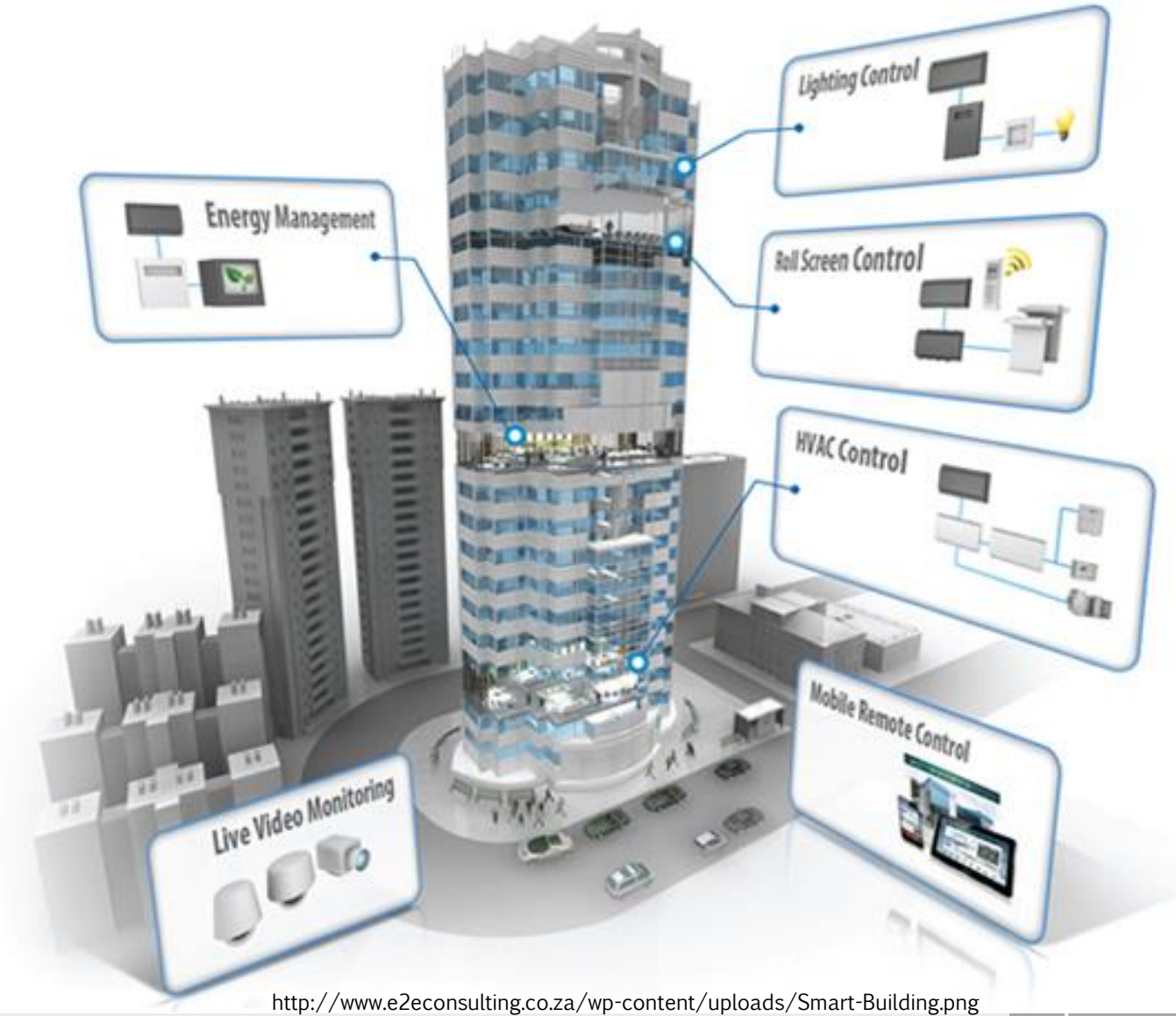
- Lighting control
- HVAC control
- Security check
- Mobile remote control

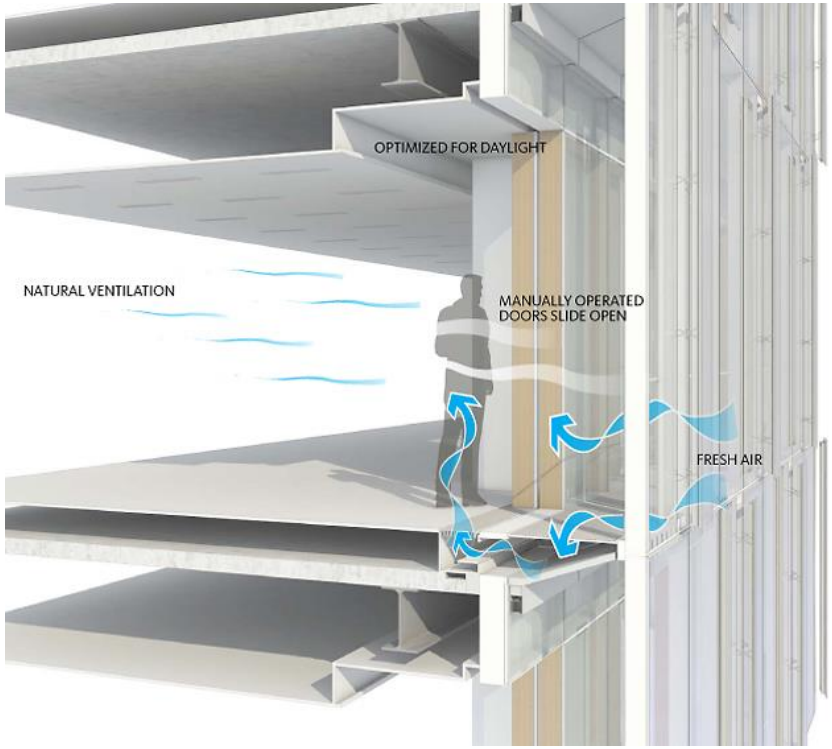


http://www.e2econsulting.co.za/wp-content/uploads/Smart-Building.png

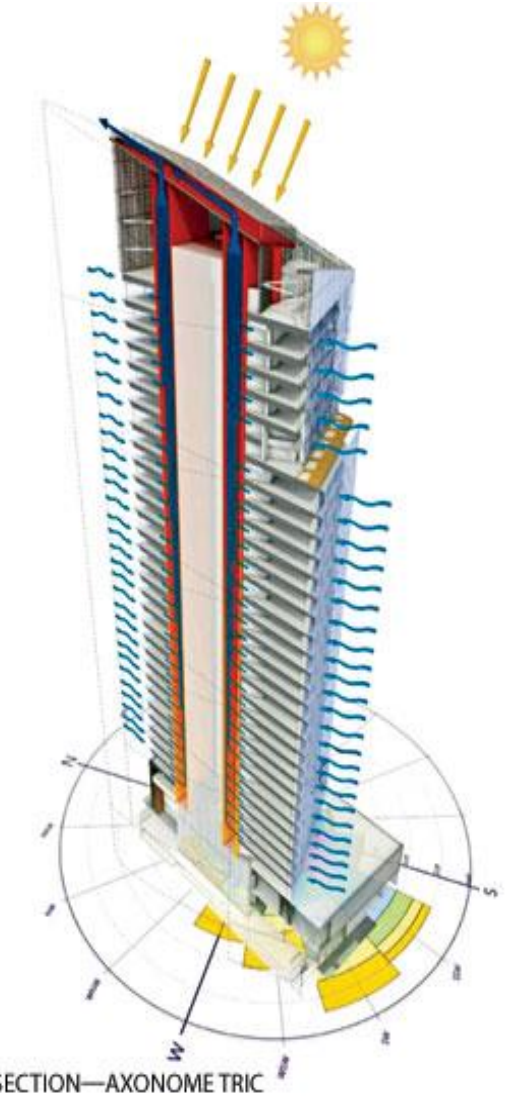
SMART SKIN

PNC Plaza, Pittsburg, USA

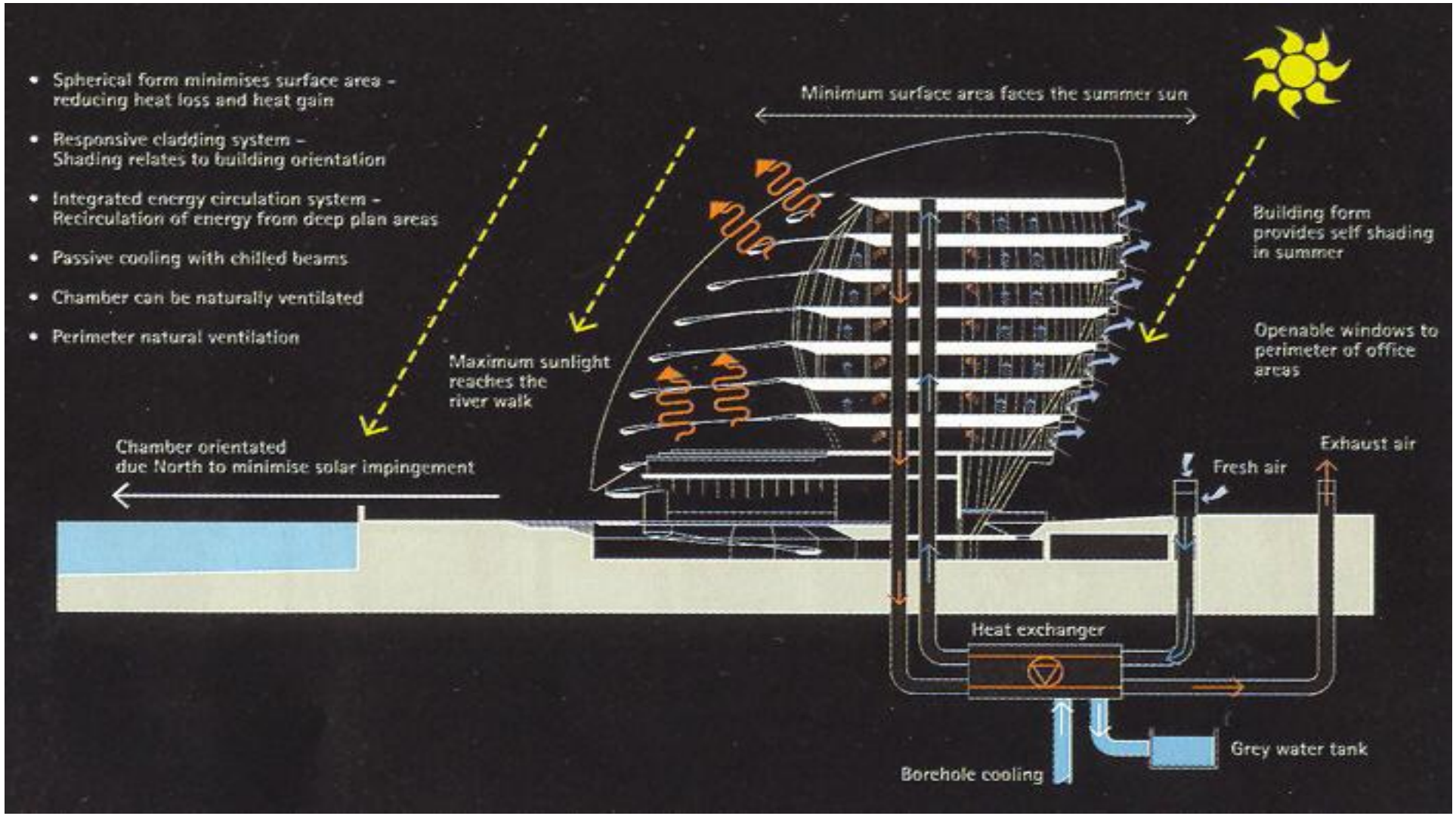
http://corporate.ppg.com/getmedia/6412a6f6-db79-442d-8724-92b7635022bb/TowerAtPNCPlaza_PPG_FifthAvenueS.jpg.aspx



http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2012/11/The-Tower-at-PNC-Plaza-Genlser-8.jpg



Source: http://www.konsys-international.com/images/landscape-smart-cities.jpg



Source: http://www.konsys-international.com/images/landscape-smart-cities.jpg

Heating and cooling systems

- Weather-based heating supply temperature control (outdoor temperature, wind).
- Intelligent thermostat: the self-learning thermostat takes into account the room's thermal characteristics to determine the time required for heating / cooling the room at a given temperature, and learns with presence attitudes to find out during which periods occupants in the building, thereby optimizing energy consumption for heating and cooling.

Ventilation system

- Using of mechanical ventilation systems with heat recovery.
- Using a Variable Air Volume systems: fresh air volume changes automatically depending on the presence, CO_2 concentration, or humidity.
- Registering and displaying Indoor Air Quality (IAQ) parameters for users: indoor temperature, relative humidity, CO_2, VOC.
- Free cooling: 100% outdoor air operation below a given outdoor temperature.

Lighting system

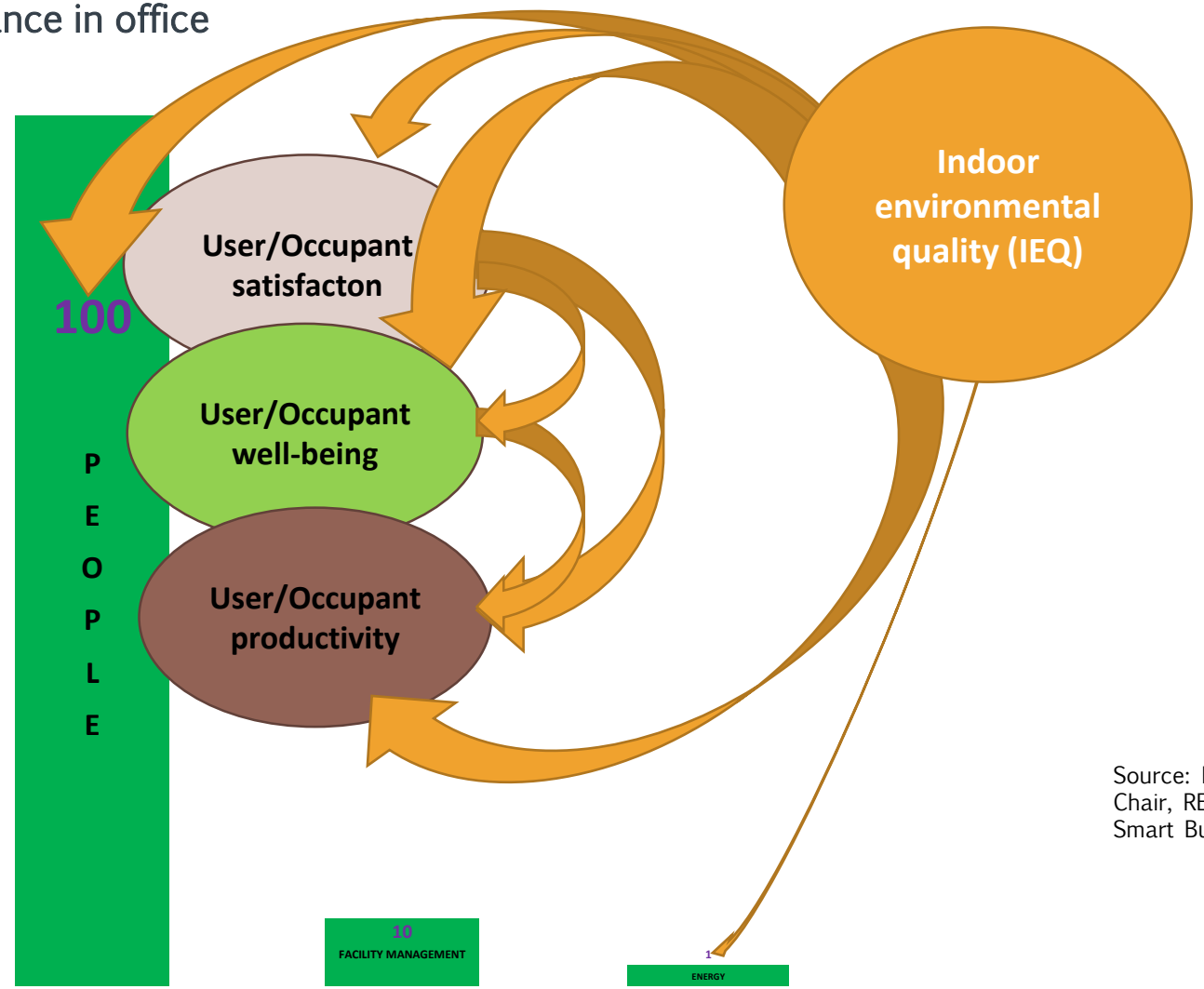
- LED light fixtures - longer life, adjustable illumination, lower energy consumption up to 60%.
- Controlling the brightness of lamps based on the outdoor illumination or according to the occupants' needs.

Smart metering

- The smart meter is suitable for transmitting and receiving data.
- The data covers the amount of consumption and the price of the service used.
- Provides real-time information on the use of the service for both consumers and service providers.
- Consumers can keep track of their current consumption and change it based on the data.

https://www.powerengineeringint.com/articles/2017/07/ipo-planned-for-swiss-smart-meter-firm-landis-gyr.html

Building-related costs and economic performance in office buildings



Source: Ivo Martinac
Chair, REHVA Smart Buildings Task Force
Smart Buildings to Maximise User Comfort

LEED smart grid approach

- LEED (Leadership in Energy and Environmental Design) is launched in 2000, and it is a widely used green building rating system.
- LEED certification is not available especially for smart buildings, however LEED v4 – the newest version of LEED – includes the **smart grid approach**, that rewards projects for participating in **demand response (DR) programs**.
- If DR program is available, the project has to participate in and the system has to be designed with the capability for real-time, fully- or semi-automated DR
- If DR program is not available, the project has to provide infrastructure to take advantage of future DR programs or dynamic, real-time pricing programs

LEED smart grid approach

- Project has to install **interval recording meters** with communications and ability for the building automation system to accept an external price or control signal.
- Project also has to develop a comprehensive plan for **shedding at least 10% of building estimated peak electricity demand**.
- Only for existing buildings: permanent load shifting, which means installing a system which permanently transfers electricity demand from peak hours to off-peak hours as defined by the local utility provider.

BREEAM certification sub-category regarding smart buildings

Sub-metering of major energy-consuming systems

- Energy metering systems are installed that enable at least 90% of the estimated annual energy consumption of each fuel
- The energy-consuming systems in buildings with a gross internal area greater than 1000 m^2 are metered using an appropriate energy monitoring and management system.
- The end energy-consuming uses are identifiable to the building users, for example through labelling or data outputs.

Sub-metering of major energy-consuming systems

- In residential buildings the aim is to recognise and encourage monitoring of energy consumption through the use of energy display devices.

- Displays at least the following
  - Local time
  - Current (real time) energy consumption (kilowatts and kilowatt hours)
  - Current (real time) estimated emissions (g/kg CO_2)
  - Current (real time) tariff
  - Current (real time) cost (per hour)
  - Visual presentation of data
  - Historical consumption data: day, week or month billing period. The data must be stored internally for a minimum of two years or must be connected to a separate device with automatic upload from the energy display device.

WELL certification sub-categories regarding smart buildings

Thermal comfort monitoring

- Project has to monitor dry-bulb temperature, relative humidity, air speed and mean radiant temperature in regularly occupied areas within the building.
- Dry-bulb temperature and relative humidity have to be measured per 10 minutes or less
- Air speed and mean radiant temperature have to be measured per 3 months or less.
- Real-time display of dry-bulb temperature and relative humidity has to be made available to occupants.

Air quality monitoring and awareness

- Measurements and real-time display are required within a regularly occupied or common space in the building at least four of the following:

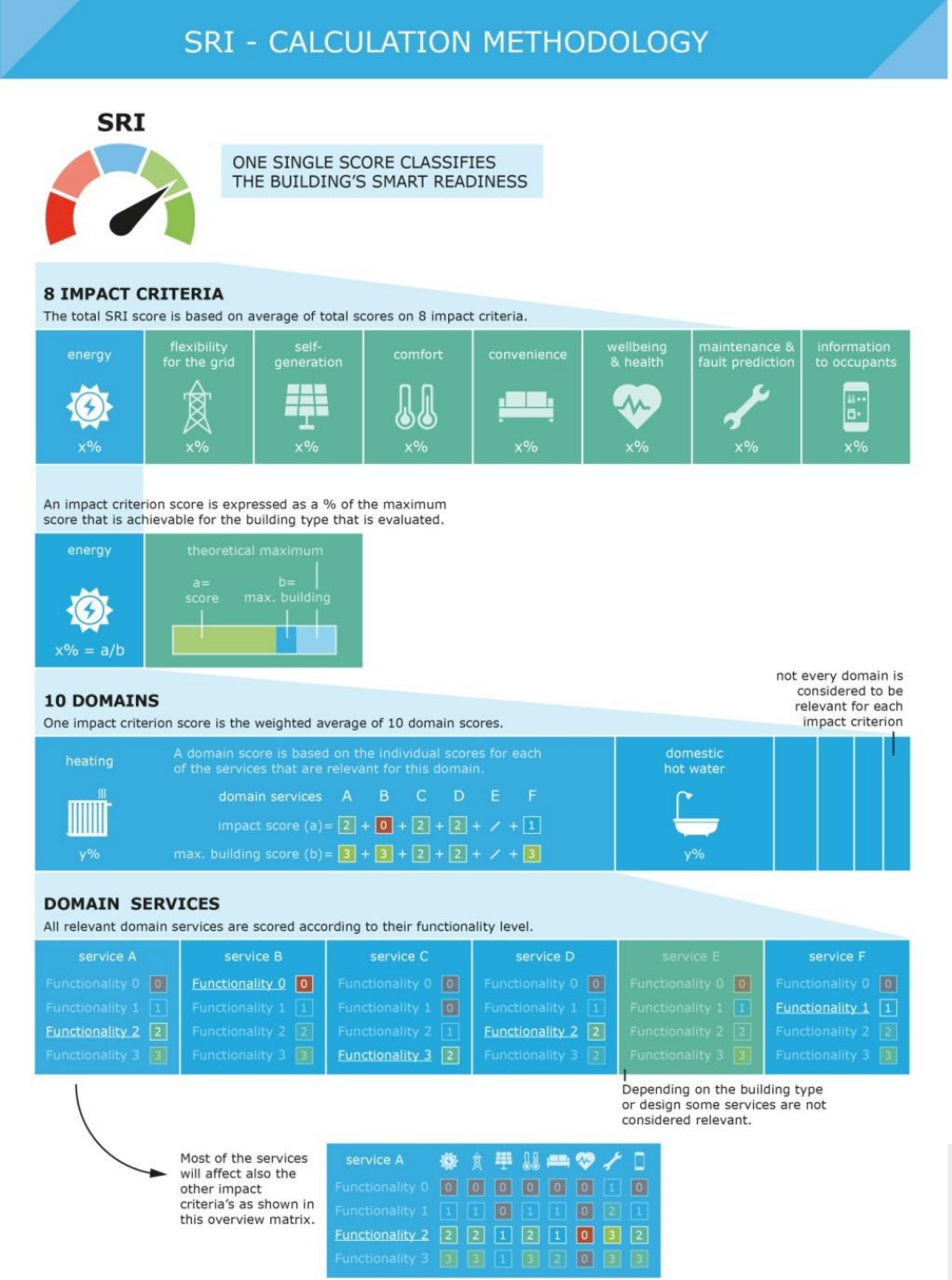
1. $PM_{2.5}$ or PM_{10} (accuracy 2 μg/m³ or finer).
2. Carbon dioxide (accuracy 25 ppm or finer).
3. Carbon monoxide (accuracy 1 ppm or finer).
4. Ozone (accuracy 5 ppb or finer).
5. Nitrogen dioxide (accuracy 5 ppb or finer).
6. Total VOCs (accuracy 10 μg/m³ or finer).
7. Formaldehyde (accuracy 5 ppb or finer).

Smart readiness indicator (SRI)

- By 31 December 2019 the Commission shall adopt a delegated act 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.

Smart readiness indicator (SRI)

- **'Smart Readiness Indicator for Buildings'** is a recent study, which was carried out by a consortium of VITO, Waide Strategic Efficiency, Ecofys and OFFIS
- The main objective of the study was to develop a harmonized SRI calculation methodology based on a multi-criteria assessment.
- The proposed SRI methodology is a qualitative labelling scheme.



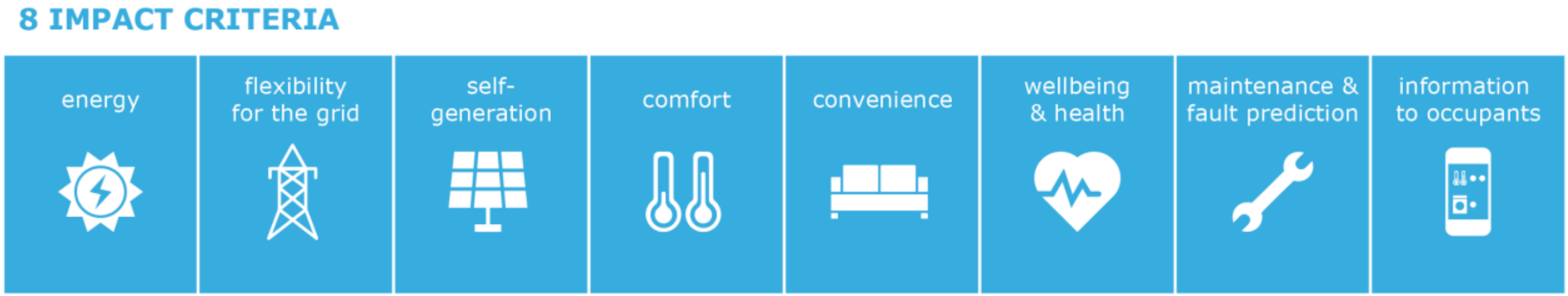
8 impact categories:

1. Energy savings on site
2. Flexibility for grid and storage
3. Self energy-generation
4. Comfort
5. Convenience
6. Well-being and health
7. Maintenance and fault prediction, detection and diagnosis
8. Information to occupants

Smart readiness indicator (SRI)

Proposed calculation: (Source: Smart Readiness Indicator under the revised EPBD Sylvain Robert and Pau Garcia Buildings team -Unit Energy Efficiency DG ENERGY, European Commission)

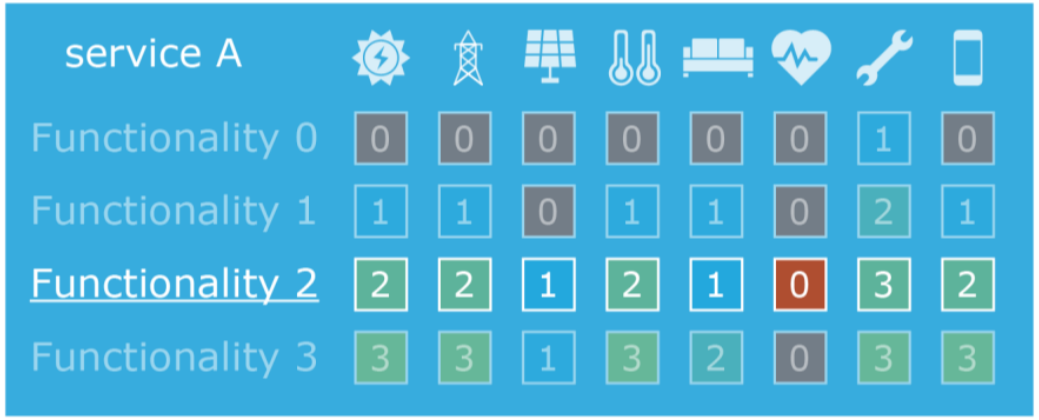
1. Assessment of available **smart-ready services: what services are available and their smartness level.**

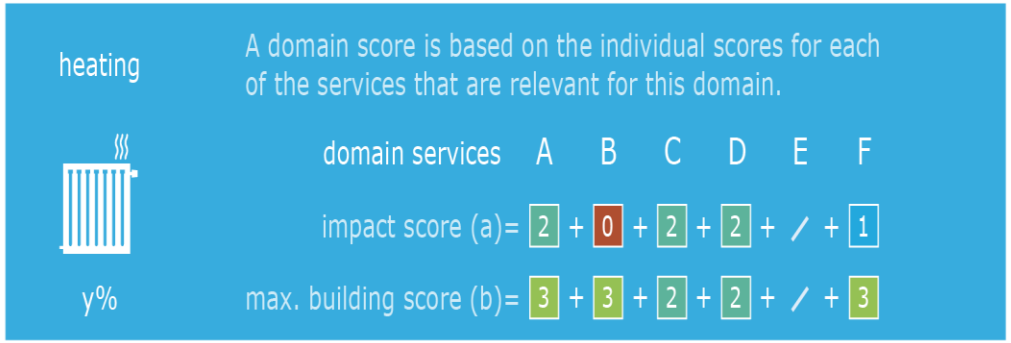


Smart readiness indicator (SRI)

2. Derivation of **individual impact scores of smart-ready services along proposed impact criteria.**

3. Aggregation of individual service impact scores into **domain impacts scores (heating, controlled ventilation, etc.)**
4. Aggregation of domain impact scores into **total impacts scores** (energy, comfort, etc.): **weighted sum** of the domain impact scores.





Thank you for your attention!

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