Part 1.5
Examples of smart buildings

HEP-ESCO

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EXAMPLES OF SMART BUILDINGS

What follows are four real life examples of smart buildings across Europe that are presented through:

- Short technical description for each building
- Potential for improvement of the building in the direction of smartness

The last slide leads you to two links on another two smart buildings where you can explore further by clicking on the links.

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Case study n°1

THE BUILDING:

Building type	Non-residential (office building)
Location	Bettembourg, Luxembourg
Surface area	2200 m²
Construction year	2014
Specificities	The NeoBuild building is a pilot project for environmental performance and renewable energy production. It allows testing novel technologies, materials and building components

MAIN TECHNICAL CHARACTERISTICS:

- EPC* class A
- Heat pumps (ground to water & air to air)
- Solar panels (thermal & PV) on the roof and on several sides
- Energy storage on site
- No active cooling

Case study n°1

IMPROVEMENT POTENTIAL:

DECISIONS	Smart grid implementation: building systems responding to electric grid signal	Intelligent charging stations on at least 10% of parking spaces (user indication of charge and control at vehicle level)	Predictive management & occupant feedback for blinds, heating, DHW, ventilation and battery charging. Smart control depending on occupancy and weather conditions
ACTIONS	Involvement of the DSO and configuration of systems	Installation of a sufficient number of adequate EV charging stations	Data analysis and prediction models to develop and deploy
IMPACTS	Increased energy flexibility and storage	Better convenience, improved information to occupants, increased energy flexibility and storage	All SRI impact criteria improved by such a broad action

Case study n°2

THE BUILDING:

European Commission

Building type	Residential (semi-detached houses)
Location	Olm, Luxembourg
Surface area	200 m²
Construction year	2020
Specificities	The Elmen social housing project, developed by SNHBM, is expected to become a model of sustainable construction in Luxembourg. The case study concerns the demo house of the project.

Demo house of the Elmen project. © Sébastien Thomas

MAIN TECHNICAL CHARACTERISTICS:

- EPC* class B
- 4-in-1 heat pump providing heating, cooling, ventilation and domestic hot water
- Heating mainly via ventilation + electric floor heating system
- Electric vehicle charging
- PV solar panels and Li-Ion batteries

Case study n°2

IMPROVEMENT POTENTIAL:

European Commission

DECISIONS	Provide feedback to occupants on various systems, with a more complete energy monitoring, benchmarking, predictions, fault detection and predictive maintenance	Integrate the different systems into one single platform	Improve the ventilation management, based on air quality and occupant information	Smart grid implementation: building systems responding to electric grid signal
ACTIONS	Installation of light software and hardware solutions with gateways	Installation of a single Building Operating System	Installation of sensors and data analysis	Involvement of the DSO and creation of a micro-grid
IMPACTS	Greater convenience, easier maintenance and fault prediction, better information to occupants	Improved energy efficiency and greater convenience	Greater energy efficiency, comfort and convenience, improved health & well-being	Improved energy flexibility and storage

Case study n°3

THE BUILDING:

European Commission

Building type	Non-residential (office building)
Location	Aix-en-Provence, South of France
Surface area	13,772 m² **Construction year** 1970's
Specificities	This research center is a group of several buildings supplied by a collective boiler room.

MAIN TECHNICAL CHARACTERISTICS:

- EPC* class: E
- Heating by gas boiler with remote controlled device
- Cooling by air/water heat pump
- Single flow ventilation for 90% of the floor area and double flow on 10%
- Some EV charging points

Case study n°3

European Commission

IMPROVEMENT POTENTIAL:

DECISIONS	Smarten the building's dynamic envelope	Renovate the lighting system	Renovate the ventilation system	Generate on-site electricity and smartly manage it
ACTIONS	Installation of motorized sun protections for combined light/blind/HVAC control	Installation of occupancy and sunlight sensors for scene-based light control	Installation of air handling units with exchanger, bypass and night over-ventilation	Install rooftop PV panels and a microgrid to share the renewable electricity with all the buildings of the site
IMPACTS	Increased comfort and convenience, enhanced energy efficiency and information to occupants	Greater energy efficiency, comfort and convenience	Improved energy efficiency, comfort and convenience, enhanced maintenance	Increased energy flexibility, reduced constraint on the grid due to optimized self-consumption

Case study n°4

THE BUILDING:

European Commission

Building type	Non-residential (health sector)
Location	Western Slovenia
Surface area	3,630 m²
Construction year	1980
Specificities	All technical domains addressed by the SRI are present, with the exception of electric vehicle charging. The building underwent a comprehensive energy renovation in 2019.

MAIN TECHNICAL CHARACTERISTICS:

- Electricity consumption: 73 kWh/m²/yr
  District heating: 77 kWh/m²/yr
- Connected to the local district heating network
- Modern energy management system installed
- Several split-system units across the building
- Heat pump for DHW production

Case study n°4

IMPROVEMENT POTENTIAL:

European Commission

DECISIONS	Upgrade the installed energy management system with demand-response functionalities and feedback to occupants	Generate on-site electricity	Renovate the lighting system and advanced control systems	Install a battery system for the peak load management, emergency supply and optimisation of the PV electricity generation
ACTIONS	Installation of smart sensors and implementation of control for non-essential HVAC* and lighting systems	Installation of photovoltaic panels	Installation of dimmable LEDs and occupancy/daylight sensors	Sizing the battery system, installation of storage batteries, connection of battery management system to EMS*
IMPACTS	Reduction of electricity and heat consumption, enhanced information to occupants	Reduced electricity consumption from the grid, increased energy flexibility	Greater energy efficiency, comfort and convenience	Improved self-consumption, increased energy flexibility

EXAMPLES OF SMART BUILDINGS

You can also see examples of smart buildings in the following links:

- **The Edge - Amsterdam**, Netherlands(https://edge.tech/buildings/the-edge).
- **Bloomberg HQ - London**, UK (https://www.bloomberg.com/company/press/bloomberg-most-sustainable-office-building/).

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