Module 12

Smart Controls and Meters

Energy Efficiency for Construction

24 partners

12 countries

Date of Event

*Author/ **Institute***

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Smart Controls and Meters | Summary

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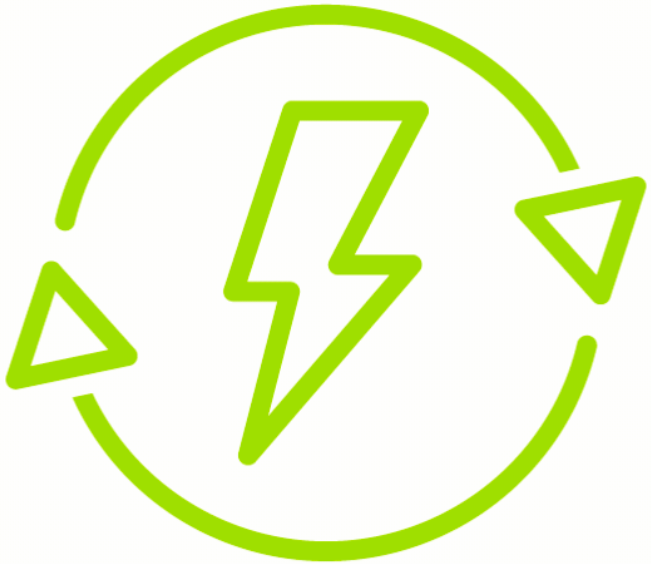
To equip the learner with the basic knowledge required to understand Smart Controls and Smart Metering.



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Smart Controls and Meters| Objectives

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- Outline how an occupant and/or energy provider can be controlled efficiently using **smart electrical appliances**
- Outline the benefits on how **Smart Controls** can support the construction of nZEB building.
- Outline how a **smart meter** imports and exports electrical energy from the home.
- Identify emerging **technologies** in the smart metering, smart appliance sectors

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1. Smart Controls and Sensors

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Smart Controls and Sensors

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A smart home can include the following:

- control panel
- heating controls
- smart locks
- video doorbell
- garage door control
- smoke & CO_2 alarms
- motion sensor with camera
- temp humidity sensor/water meters
- video cameras
- video cameras
- window sensors
- lighting controls

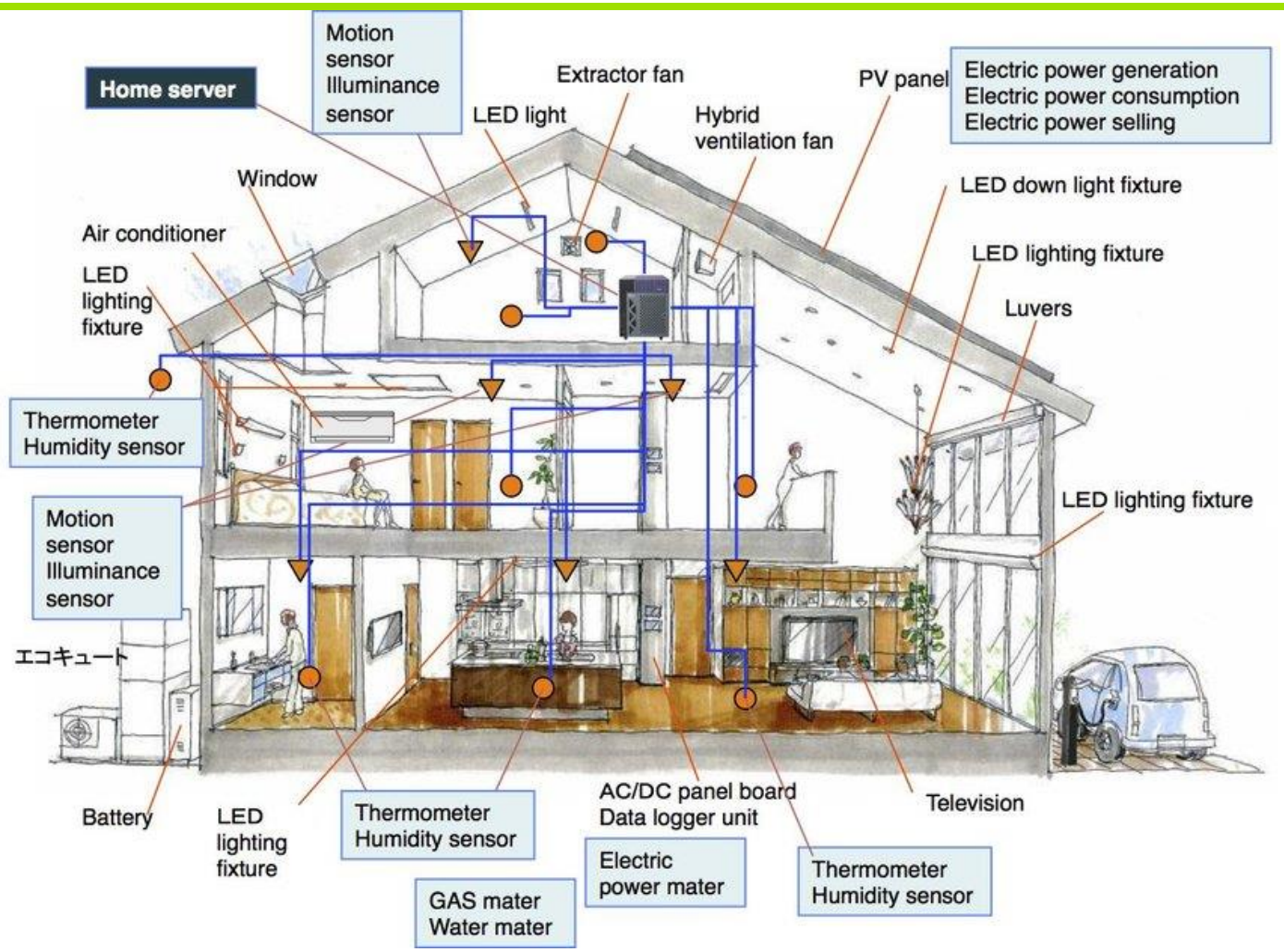

Image Source: Tetsuya Toma

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5.3.3 Services Checks

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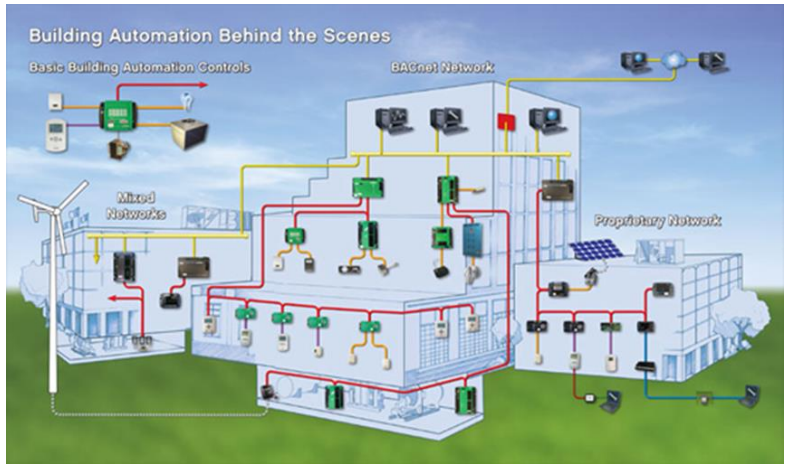
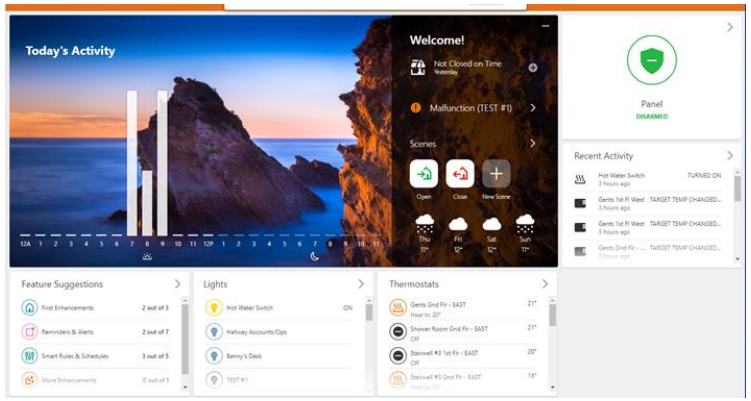


Smart controls for a large building



Smart buildings can be controlled remotely, either by Wi-Fi or cellular connection ensuring the system will not go down.

Smart buildings are growing in popularity due to their many advantages.

They also include security making it easier to monitor a building or home whether you're inside or away.

Energy management is also a main feature of smart controls, which include adjusting the thermostat, turning on and off lights and monitoring water usage.

Source: BIMzeED Project

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Remotely Controlled Heating and Domestic Hot Water

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Traditional controller is replaced with wifi enabled **remotely accessible controller**

On-line control of heating and hot water enabled from anywhere

Most systems have an App which enables **control on your smartphone**

Most systems enable **storage of energy use data** which can educate homeowners about usage patterns

Image Source: Climote

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Remotely Controlled Heating and Domestic Hot Water

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Edit desired times/days and zones

Boost - switch on heating instantly in the areas of the house you choose.

Holiday mode - suspend heating schedules without cancelling them

User reports - up-to-date data on home heating usage

Manage, create and add different 7 day **heating schedules**

Image Source: Climote

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Providing Internet Access and Wifi in the Home

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Physical connection to mains via telephone cable or optic fibre

Internet speeds via telephone cable can be poor

Alternative – wireless connection to local tower using a satellite mounted on the exterior of the house

Signal provided via a modem

Boosters around the house will improve internet speeds throughout

Image Source: Imagine

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Telephone, Intruder Alarm and Satellite TV

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Use of traditional landline technology is reducing significantly in Ireland (*in 2018, just 50% of homes have a landline - RTE*)

Ireland has the highest rate of mobile phone use in EU, 90% of adults (*Deloitte*)

Alarms and TV increasingly being connected via wifi or GSM (either with cable connection or using satellite / modem)

Typical house alarms and Wifi modem, each use approximately 6 Watts.

Image Source: MosArt

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2. Smart Meters

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Smart Meters

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Use digital technology & mobile phone network to provide accurate **information on energy use.**

Records details of your electricity **consumption** and any electricity **exported** onto the grid, through use of photovoltaic panels

Record the amount of electricity consumed during the:
Day (8.00hrs to 17.00hrs and 19.00hrs to 23.00hrs),
Peak (17.00hrs to 19.00hrs) and
Night 23.00hrs to 8.00hrs.

Will allow home/building owners to **change their energy use** to a time when the grid is not under pressure, or supplied mostly with renewable energy and therefore have a lower electricity tariff and cleaner energy

Remote metering – no more estimated bills

Image Source: ESB Networks

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Smart Household Appliances

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- A ‘Smart Appliance’ includes the intelligence and communications to enable **automatic or remote control** based on user preferences or external signals from a utility or third party energy service provider

- Two modes: (a) **modification of the starting time** of an appliance cycle (for example, a washing machine or dishwasher) and b) **interruption of regular operation** (for example, heating system)

- Example: washing machines and dishwashers can shift their demand to **hours of high solar** electricity production

- Alternatively, appliances **operate during off-peak**, when electricity when costs are lower

Image Source: Siemens

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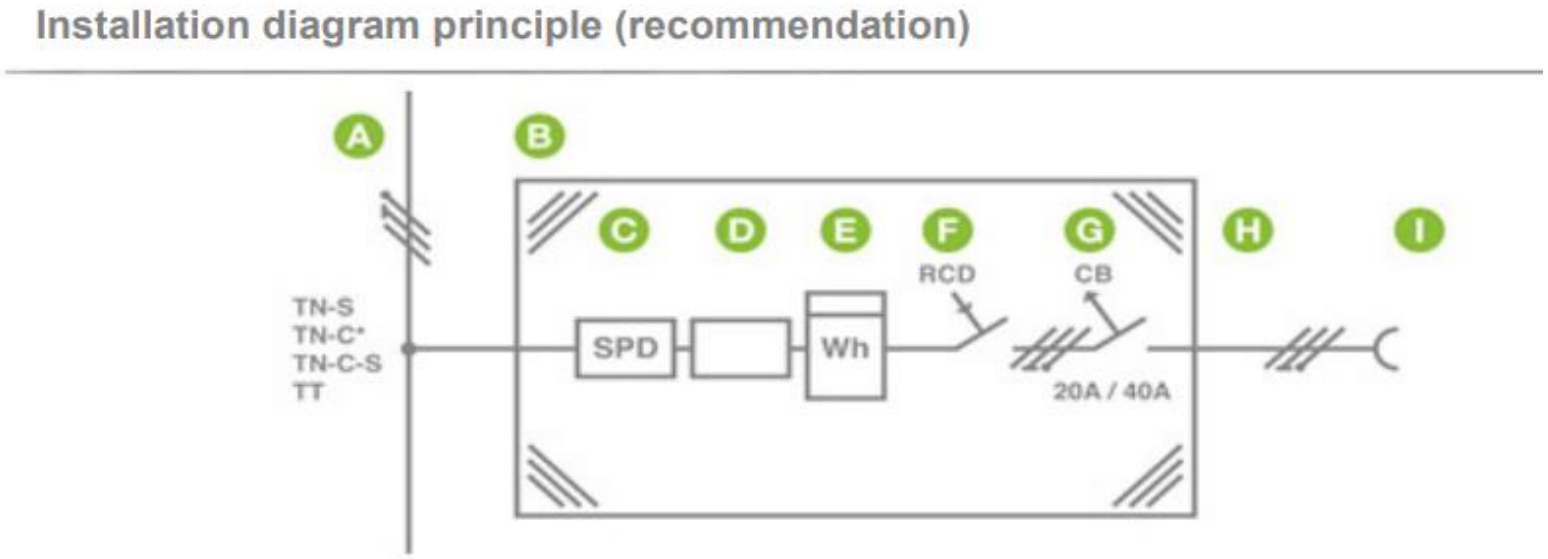
An example installation schematic for EV charging is provided below



A Grid
B Fuse box
C Lightning protection (optional)
D Main/back-up fuse
E Meter
F Residual current device: type A RCD, type B RCD or alternatively type A RCD with EV direct current detection
G Circuit breaker: tripping characteristics C
H Own electric circuit
I Charging unit (according to VDE 722)

Image Source: mobilityhouse

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Electric Vehicle Charging Installation Considerations

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Consider the customer's **preferred parking direction**
Charging cable should not present a **trip hazard** when plugged in
Every charging point must be connected with appropriate **circuit breaker**
Circuit breaker value depends on **cable's load capacity**, charging station's charging power and length
Recommended to **future-proof** load capacity for 22kW charging power (5-core cable)
Use **flexible cables** to enable easier handling
Install **data connection** so that charging station can be linked to smart metre to enable photovoltaic charging (some chargers have this facility built-in)

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Electric Vehicle Charging Case Study

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- Compatible with all plug-in vehicle brands
- Power ratings 3.6kW, 7kW, 11kW, 22kW
- Untethered or tethered
- Works with solar PV or wind turbine systems
- Dynamic load management system (eco modes)
- Possibility to add remote monitoring via App
- Lockable by pin for added security

Image Source: ecarinfra

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Battery Electricity Storage

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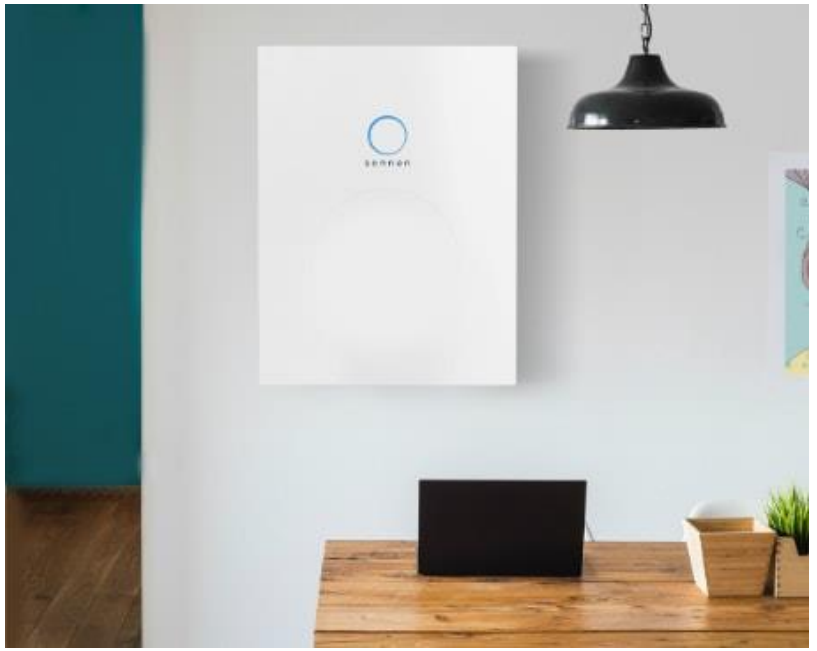
- **Capacity: 5 kWh** is the most common size for residential use, but 7.5 kWh and 10 kWh also possible (additional batteries can be added to extend the capacity)
- **Size:** brand supplied by Electric Ireland – 5 kWh = 88cm x 67cm x 23 cm, weighing 81 kg
- Require **internet connection** for system monitoring
- Most battery systems come with **Apps and web portal interface**
- **Warranty** – Electric Ireland system has 10 year warranty or 10,000 charge cycles (battery will have at least 70% of installed capacity after 10,000 cycles)



You may be able to get a grant for solar PV systems > 2 kWp, but only if you have a battery

Image Source: Electric Ireland

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Assessment

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