The Changing world of the electro-technical sector

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Luke Osborne
Energy and Emerging Technologies Solutions Advisor

AGENDA

- ECA
- The changing world
- The energy revolution
- New and evolving sectors
- Being smart about it
- Summary

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Solutions Advisor

JOINT RESPONSE TO BEIS

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THE CHANGING WORLD

- Rapidly changing and evolving technologies
- Safety, standards and legislation continue to grow
- Knowledge, techniques and an understanding of interaction

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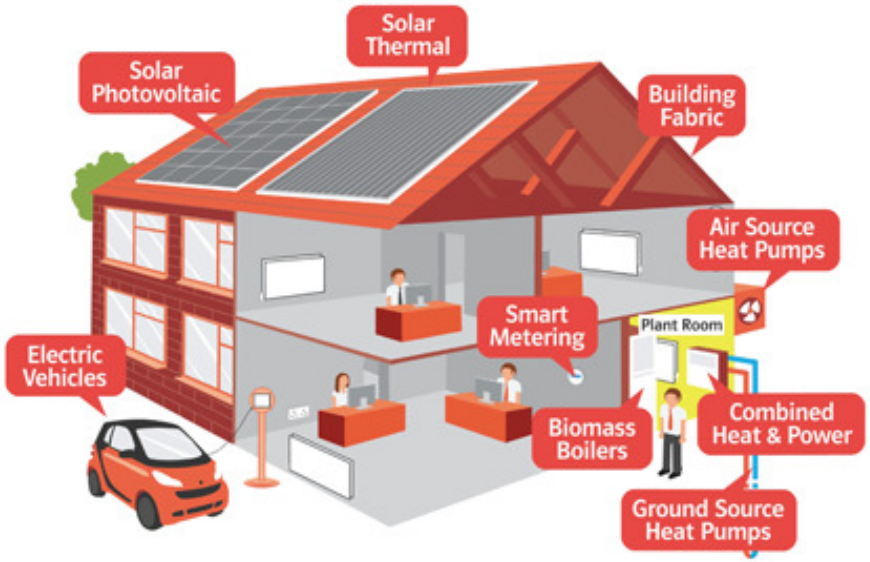
ENERGY REVOLUTION

- Entering 4th industrial revolution
- Building on the digital revolution
- Couple this with demands for energy efficiency and a new world appears



(www.eonenergy.com)

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LOW CARBON, ENERGY EFFICIENCY DRIVING FORCES

- Global Climate Change acceptance
- Efficiency legislation
- Rapid advance of technology
- Economies of scale, affordability
- Fuel costs (awareness of volatility)

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Energy and Emerging Technology Solutions Advisor

ECA RECOGNISE THE CHANGES

- Provide support in:
  - Micro-generation / Renewable Energy
  - Electrical Energy Storage
  - Electric Vehicles and charge points
  - Energy Efficiency
  - Smart homes / Smart Cities
  - Industrial IoT
  - BIM, BACS and BEMS

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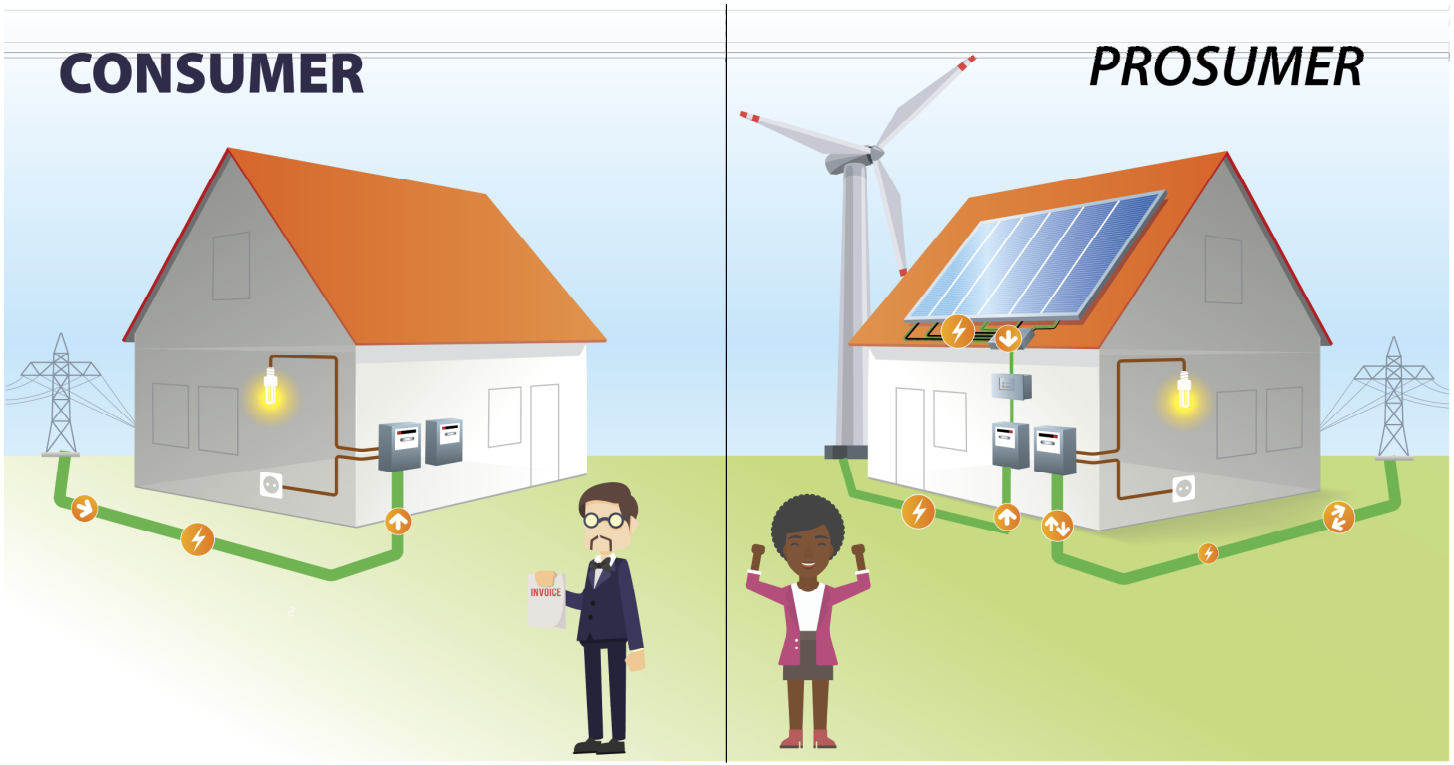
PROSUMER



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Luke Osborne and Darren Smith

MICRO-GENERATION

- Solar PV
- Wind turbines
- Heat Pumps
- Bio-mass Boilers
- Solar Thermal

(Prc-magazine.com)

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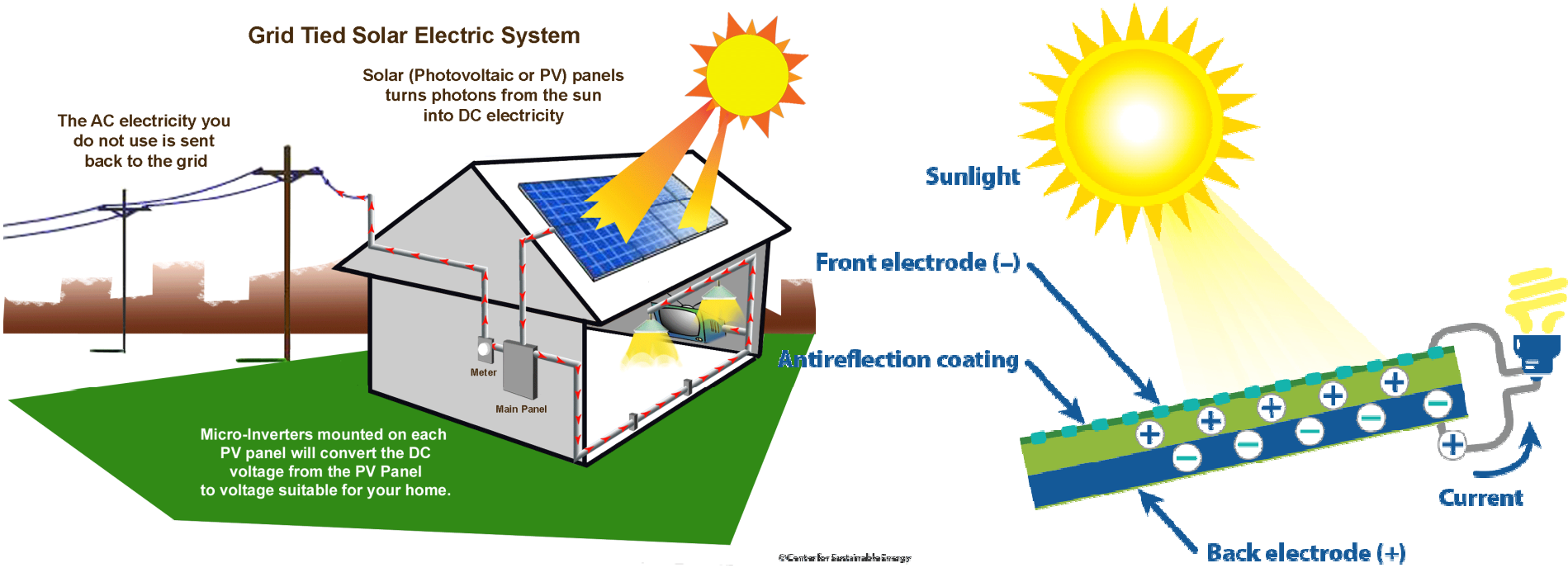
DIRECT ELECTRICITY PRODUCTION- SOLAR PV



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OPPORTUNITIES FOR CONTRACTORS

- New build projects:
  - PV will become a default product used in the fabric of the building (in-roof system)
- Retrofitting to existing buildings- commercial and domestic
- Standalone
- Maintenance
  - Schedule of periodic inspection for cables, connectors and inverters

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DIRECT ELECTRICITY PRODUCTION

- On-shore: £30m less / year / GW vs off-shore
- On-shore: £100m less / year / GW vs Nuclear
- Potential for co-location with Solar PV and storage

Wind turbines

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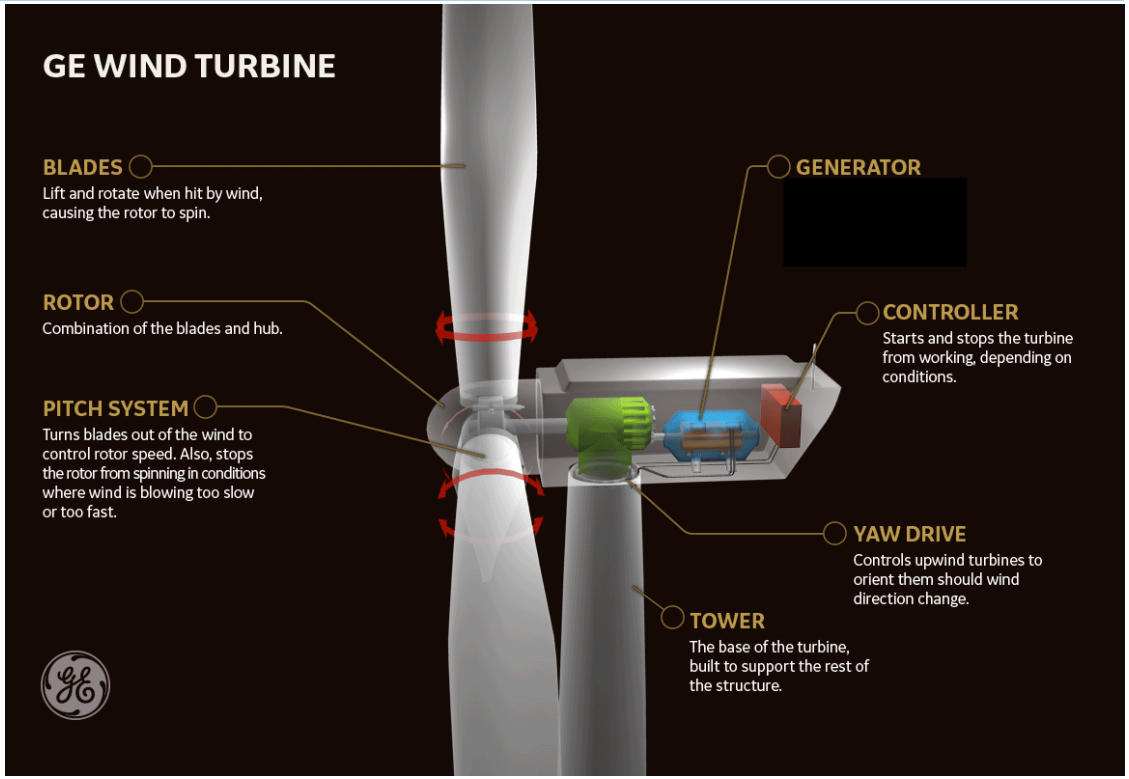
Energy and Emerging Technology Solutions Advisor

DIRECT ELECTRICITY PRODUCTION

- On-shore: £30m less / year / GW vs off-shore
- On-shore: £100m less / year / GW vs Nuclear & Biomass
- Potential for co-location with Solar PV and storage



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HEAT GENERATION

- Traditionally the realm of the plumber / gas fitter
- Electrification of heat
- CCC- UK housing: Fit for the future?
- No new gas connections from ~~2017~~ 2025

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ELECTRIFICATION OF HEAT

- Nothing new- been around for decades
- Storage heaters- bad press- in efficient
  - Lot 20 minimum efficiency legislation
- Electric panel heating/ IR etc
  - High efficiency rates
  - Easy to install (be aware of surroundings)
- Electric Underfloor heating (UFH)

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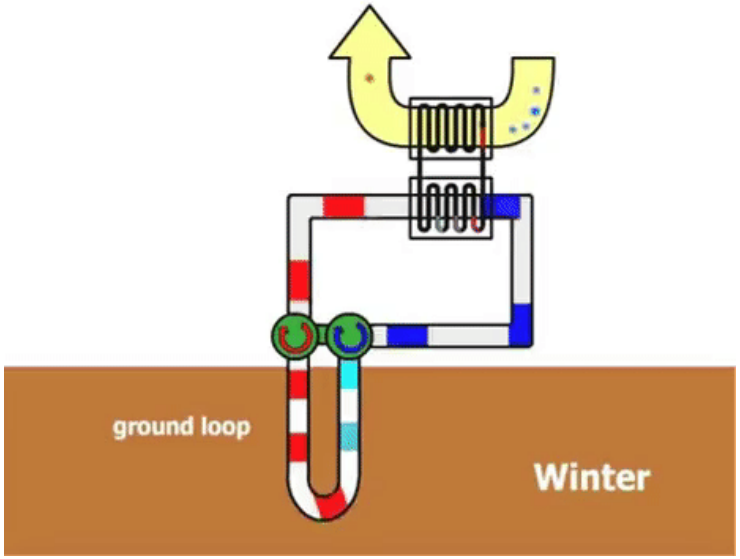
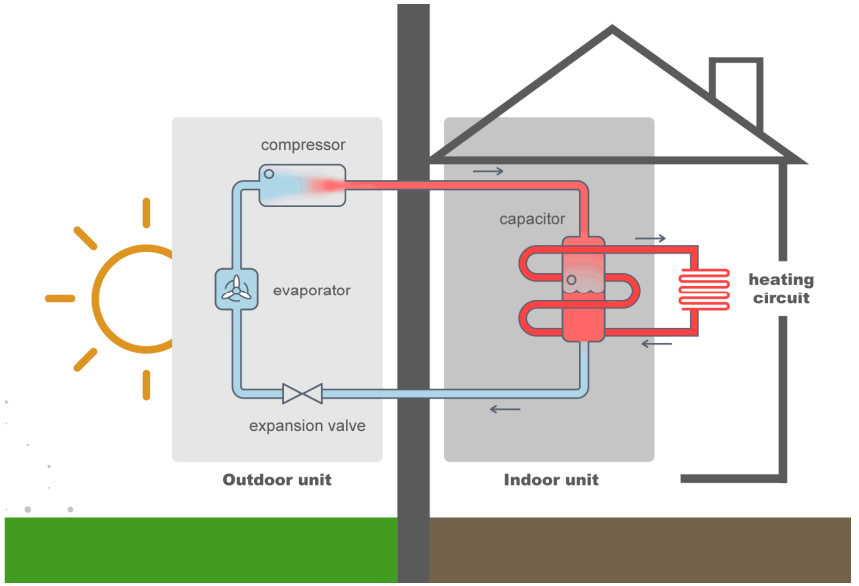
Energy and Emerging Technology Solutions Advisor

RENEWABLE HEAT GENERATION- HEAT PUMPS



GSHP



ASHP

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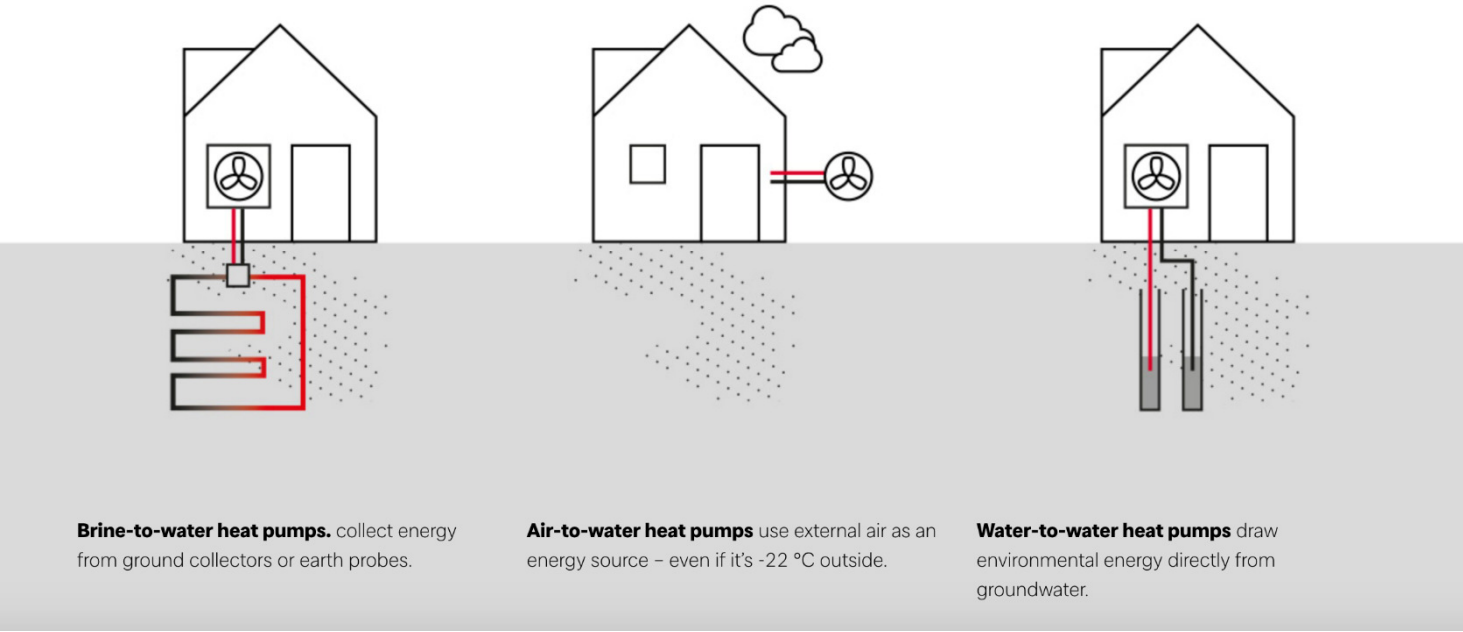
RENEWABLE HEAT GENERATION

- Heat Pumps (ASHP / GSHP / WSHP)



Brine-to-water heat pumps. collect energy from ground collectors or earth probes.

Air-to-water heat pumps use external air as an energy source – even if it's -22 °C outside.

Water-to-water heat pumps draw environmental energy directly from groundwater.

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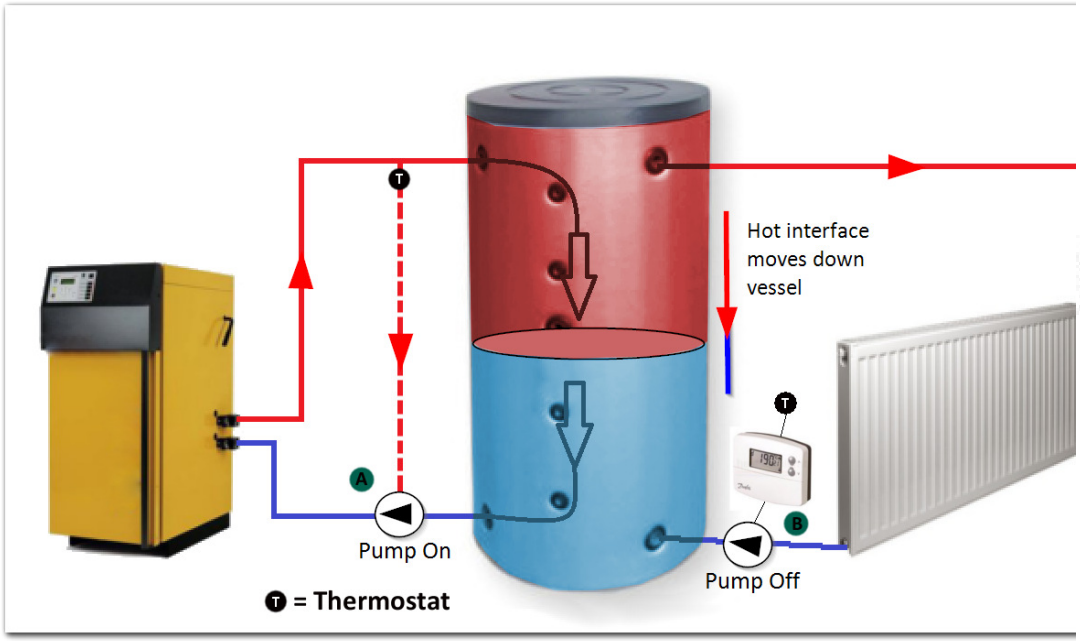
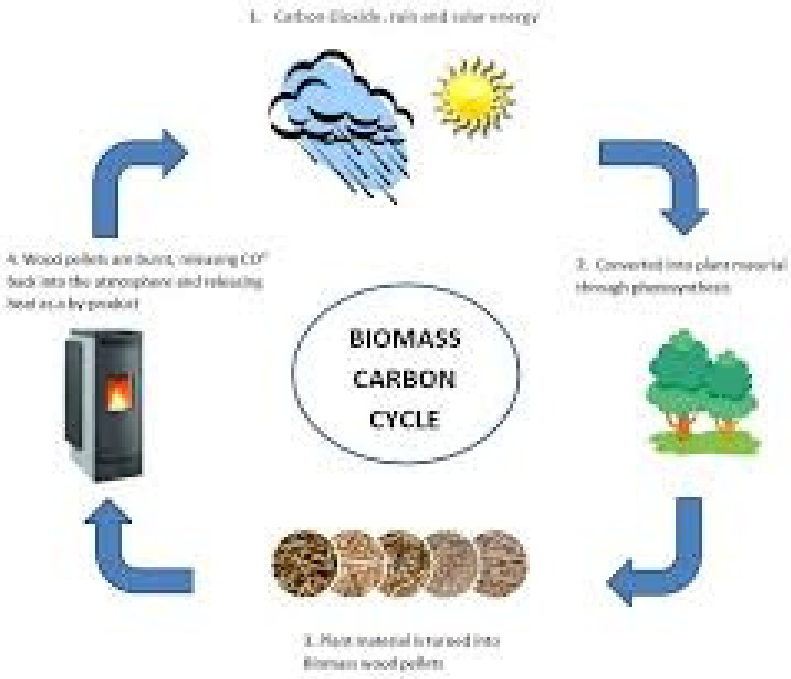
RENEWABLE HEAT GENERATION- BIOMASS BOILERS



Bio-mass Boilers



Biomass carbon cycle

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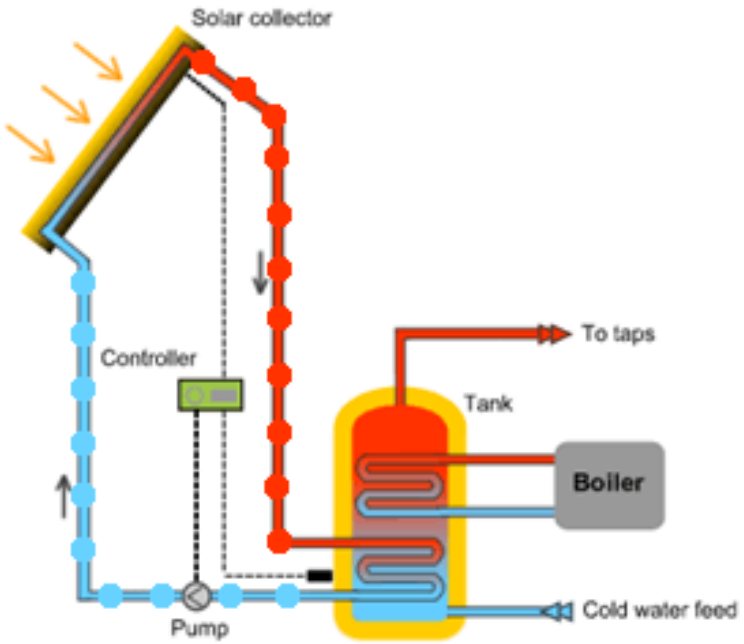
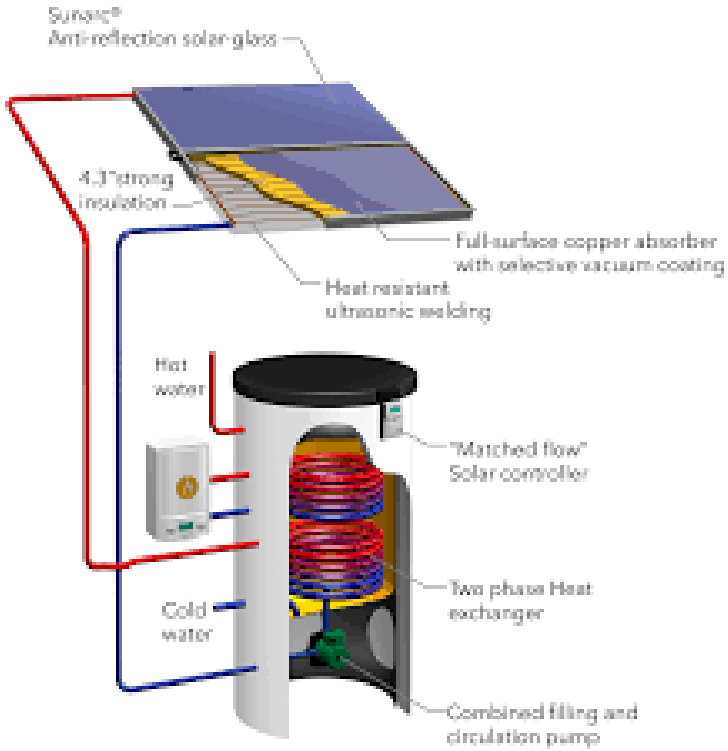
RENEWABLE HEAT GENERATION- SOLAR THERMAL





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ENERGY EFFICIENCY

- First activity in reducing energy usage and carbon footprint
- Cheapest and easiest
  - Insulation
  - Lighting changes
  - Occupancy sensors
  - Device Management
  - Replacing energy intensive devices

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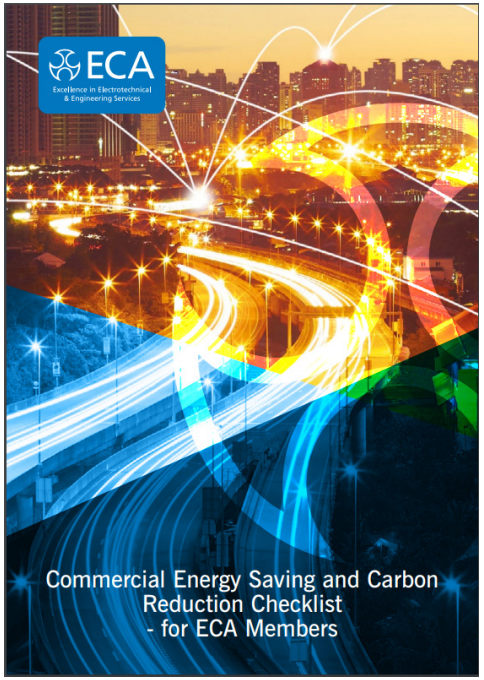
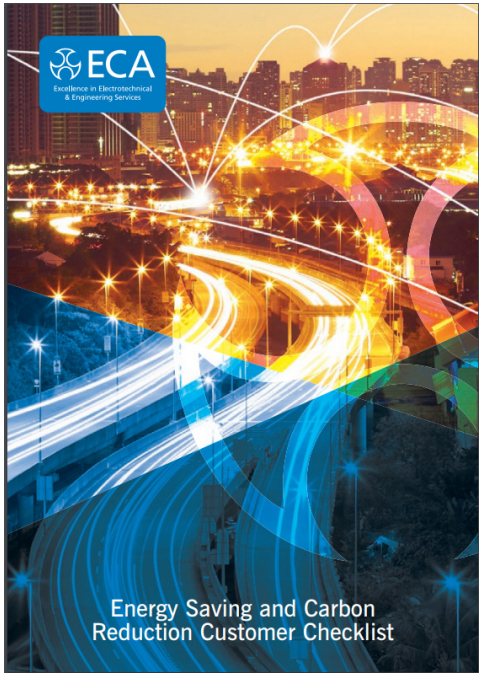
Energy and Emerging Technology Solutions Advisor

MEMBERS AND CLIENTS CHECKLISTS





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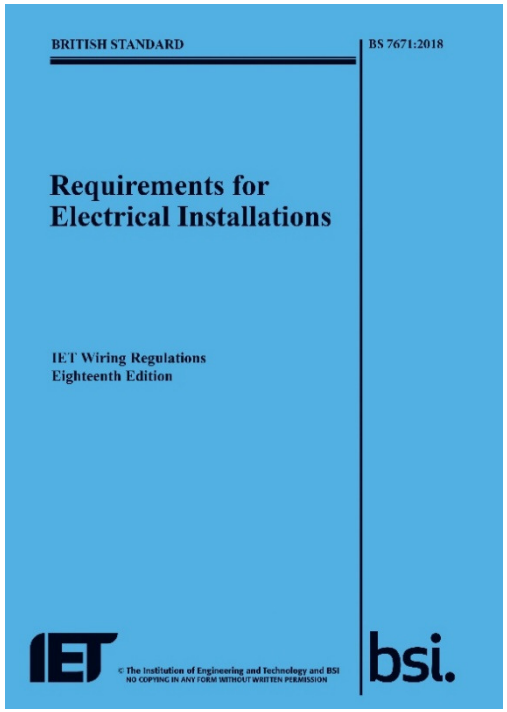
ENERGY EFFICIENCY

- BS:7871:2018 Appendix 17 Informative
  - Mainly for commercial installations
  - Enphasis on designer and installer
  - Designer to take into account:
    - Load energy profile (active and passive)
    - Availability of local generation
    - Reduction of energy losses in the electrical system
    - The tariff structure offered by supplier of electrical energy



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ENERGY EFFICIENCY

- Equipment selection
  - Energy efficient devices
  - Motors correctly matched to their loads and meeting IE3 or IE2 efficiency levels
  - Acceptable for load shedding
    - Heaters and freezers-YES
    - IT equipment- NO
- Lighting
  - Suited to environment- permanent control
  - Movement detectors, dimming switches, light sensitive switches

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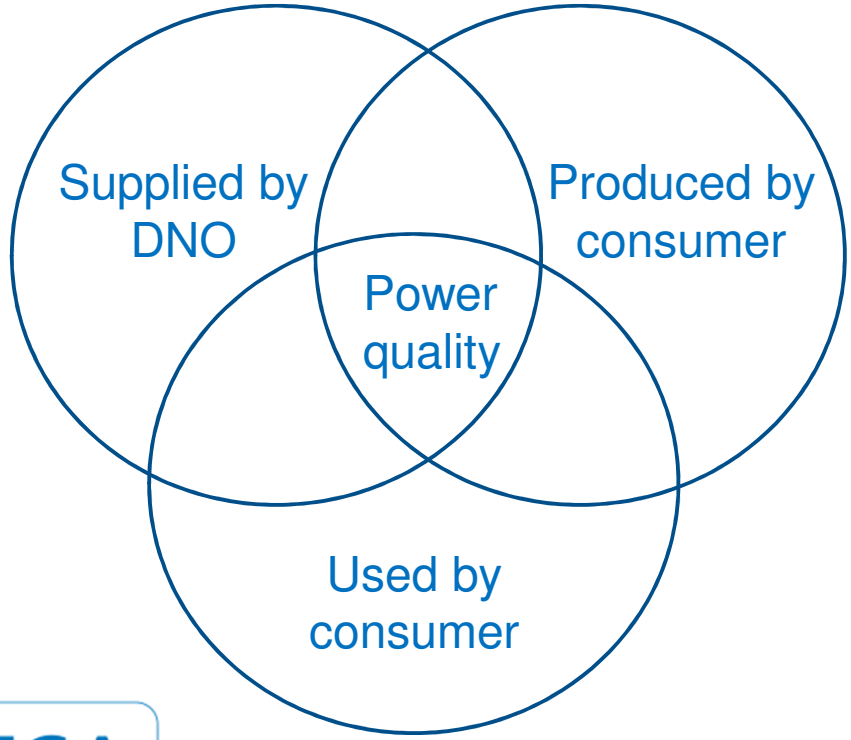
Energy and Emerging Technology Solutions Advisor

POWER QUALITY AND POWER FACTOR CORRECTION



- Power Factor
- Power Quality

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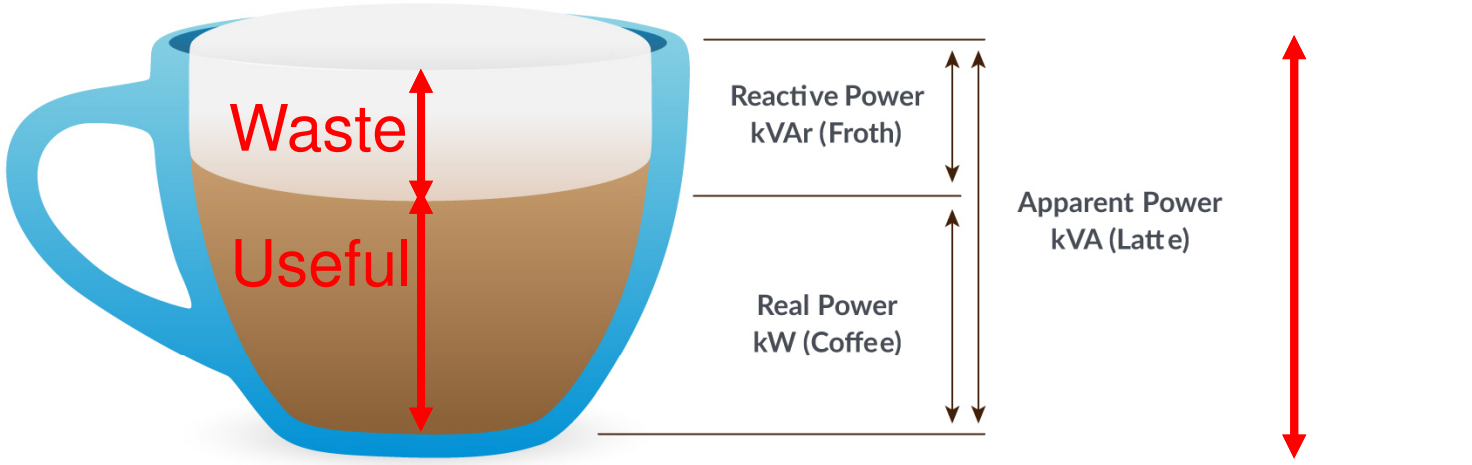
POWER FACTOR: WHAT IS IT?



$$\text{Power Factor} = \frac{\text{kW (Coffee)}}{\text{kVA (Latte)}}$$

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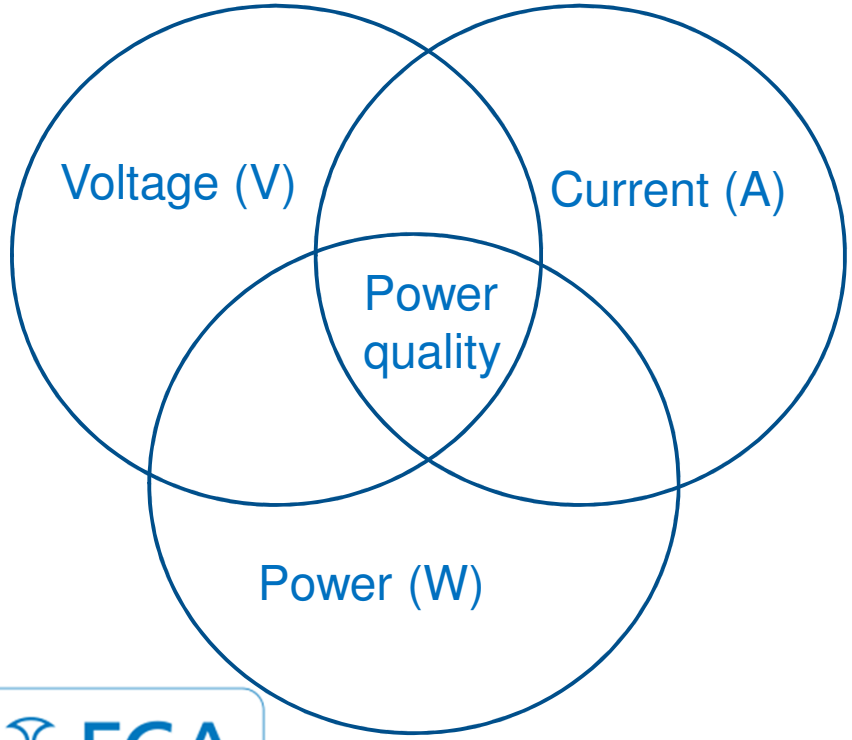
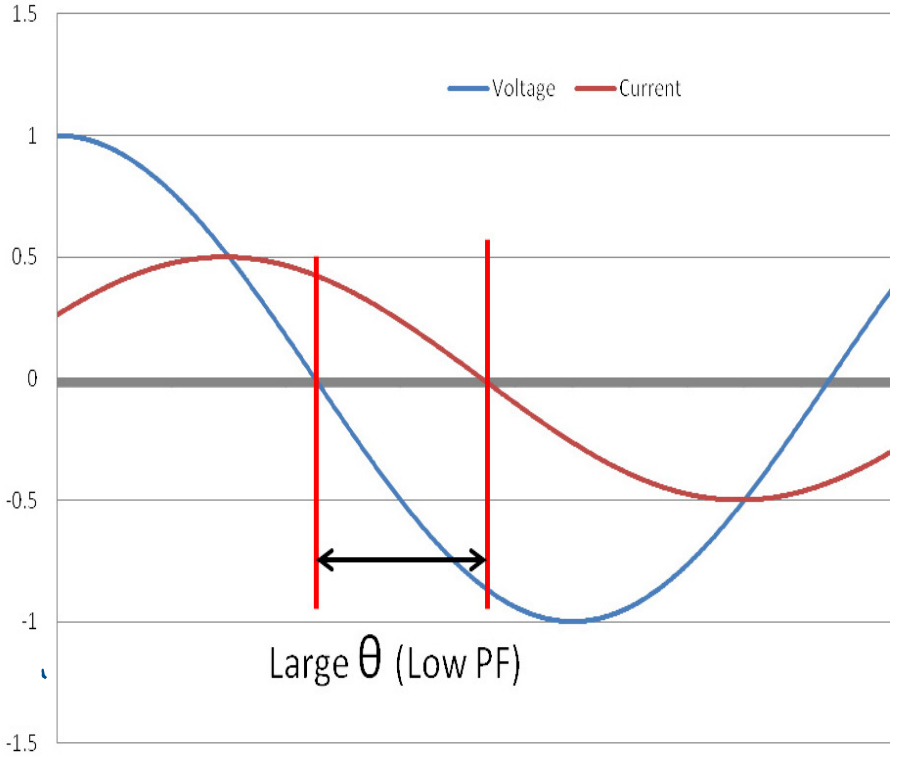
POWER FACTOR





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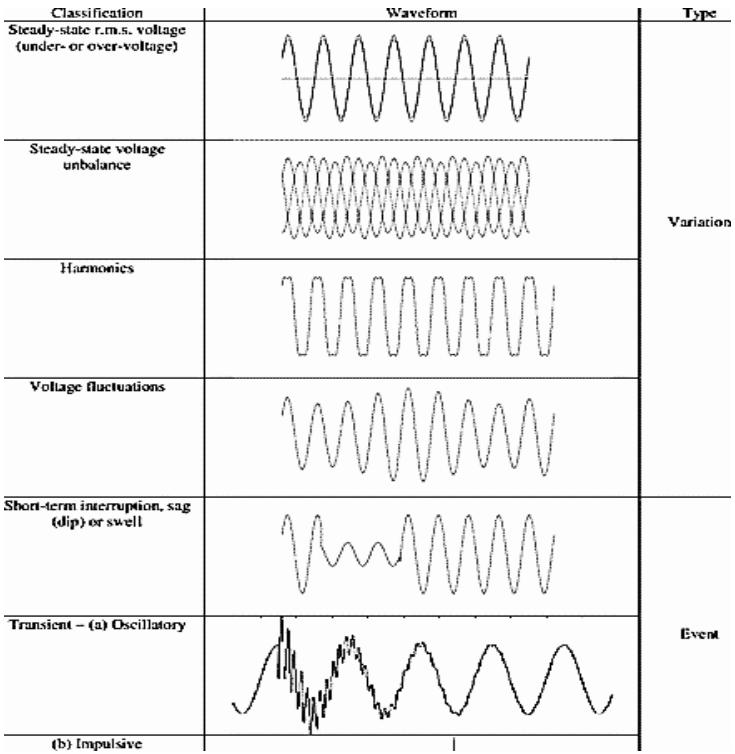
POWER QUALITY

- Harmonics
  - DC components
    - Digital equipment
    - Chargers
    - Switch mode PSU
    - AC and DC motor drives
    - Arc furnaces



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POWER QUALITY AND POWER FACTOR CORRECTION

- Significant levels of energy reduction.

- Working with Associate Members to produce an updated application guide for members
  - Enhance understanding
  - Increase deployment

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Energy and Emerging Technology Solutions Advisor

VENTILATION SYSTEMS

- As more buildings are becoming air tight there are less natural cracks and gaps
- Mechanical ventilation and heat recovery systems are necessary and efficient
- Often left to mechanical trades, the design and installation is falling more into the electrotechnical category of work

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Energy and Emerging Technology Solutions Advisor

NEW AND EVOLVING SECTORS

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ELECTRIC VEHICLES (EV)

- Early adopter phase
- Exponential increase
- Barriers to Adoption
  - Choice
  - Cost
  - Range
  - Charging

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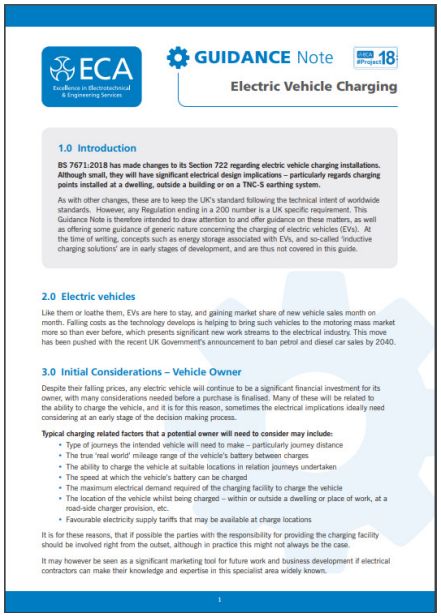
ELECTRIC VEHICLES (EV)

ECA Guidance Notes



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GUIDANCE Note

Electric Vehicle Charging

1.0 Introduction

BS 7671:2018 has made changes to its Section 722 regarding electric vehicle charging installations. Although small, they will have significant electrical design implications – particularly regards charging points installed at a dwelling, outside a building or on a TNC-S earthing system.

As with other changes, these are to keep the UK's standard following the technical intent of worldwide standards. However, any Regulation ending in a 200 number is a UK specific requirement. This Guidance Note is therefore intended to draw attention to and offer guidance on these matters, as well as offering some guidance of generic nature concerning the charging of electric vehicles (EVs). At the time of writing, concepts such as enegy storage associated with EVs, and so-called 'inductive charging solutions' are in early stages of development, and are thus not covered in this guide.

2.0 Electric vehicles

Like them or loathe them, EVs are here to stay, and gaining market share of new vehicle sales month on month. Falling costs as the technology develops is helping to bring such vehicles to the motoring mass market more so than ever before, which presents significant new work streams to the electrical industry. This move has been pushed with the recent UK Government's announcement to ban petrol and diesel car sales by 2040.

3.0 Initial Considerations – Vehicle Owner

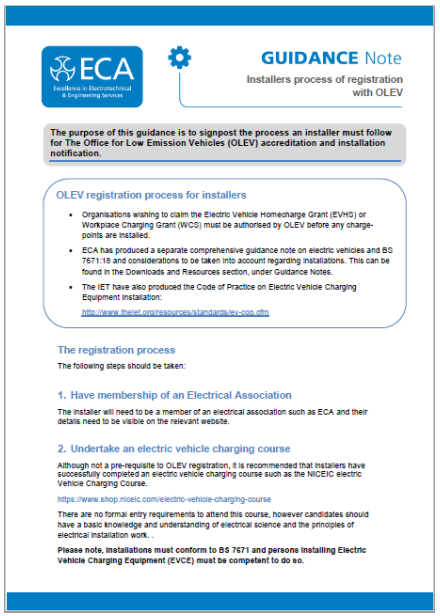
Despite their falling prices, any electric vehicle will continue to be a significant financial investment for its owner, with many considerations needed before a purchase is finalised. Many of these will be related to the ability to charge the vehicle, and it is for this reason, sometimes the electrical implications ideally need considering at an early stage of the decision making process.

Typical charging related factors that a potential owner will need to consider may include:

- Type of journeys the intended vehicle will need to make – particularly journey distance
- The true 'real world' mileage range of the vehicle's battery between charges
- The ability to charge the vehicle at suitable locations in relation journeys undertaken
- The speed at which the vehicle's battery can be charged
- The maximum electrical demand required of the charging facility to charge the vehicle
- The location of the vehicle whilst being charged – within or outside a dwelling or place of work, at a road-side charger provision, etc.
- Favourable electricity supply tariffs that may be available at charge locations

It is for these reasons, that if possible the parties with the responsibility for providing the charging facility should be involved right from the outset, although in practice this might not always be the case.

It may however be seen as a significant marketing tool for future work and business development if electrical contractors can make their knowledge and expertise in this specialist area widely known.



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GUIDANCE Note

Installers process of registration with OLEV

The purpose of this guidance is to signpost the process an installer must follow for The Office for Low Emission Vehicles (OLEV) accreditation and installation notification.

OLEV registration process for installers

- Organisations wishing to claim the Electric Vehicle Homecharge Grant (EVHS) or Workplace Charging Grant (WCS) must be authorised by OLEV before any charge-points are installed.
- ECA has produced a separate comprehensive guidance note on electric vehicles and BS 7671:18 and considerations to be taken into account regarding installations. This can be found in the Downloads and Resources section, under Guidance Notes.
- The IET have also produced the Code of Practice on Electric Vehicle Charging Equipment Installation:

http://www.theiet.org/resources/standards/ev-cop.cfm

The registration process

The following steps should be taken:

1. Have membership of an Electrical Association

The installer will need to be a member of an electrical association such as ECA and their details need to be visible on the relevant website.

2. Undertake an electric vehicle charging course

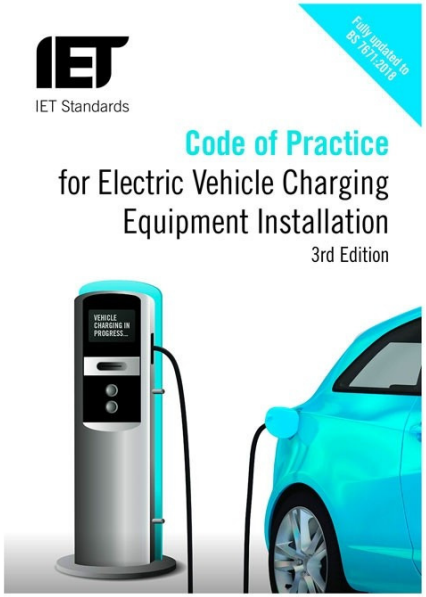
Although not a pre-requisite to OLEV registration, it is recommended that installers have successfully completed an electric vehicle charging course such as the NICEIC electric Vehicle Charging Course.

https://www.shop.niceic.com/electric-vehicle-charging-course

There are no formal entry requirements to attend this course, however candidates should have a basic knowledge and understanding of electrical science and the principles of electrical installation work. .

Please note, installations must conform to BS 7671 and persons installing Electric Vehicle Charging Equipment (EVCE) must be competent to do so.

IET CoP



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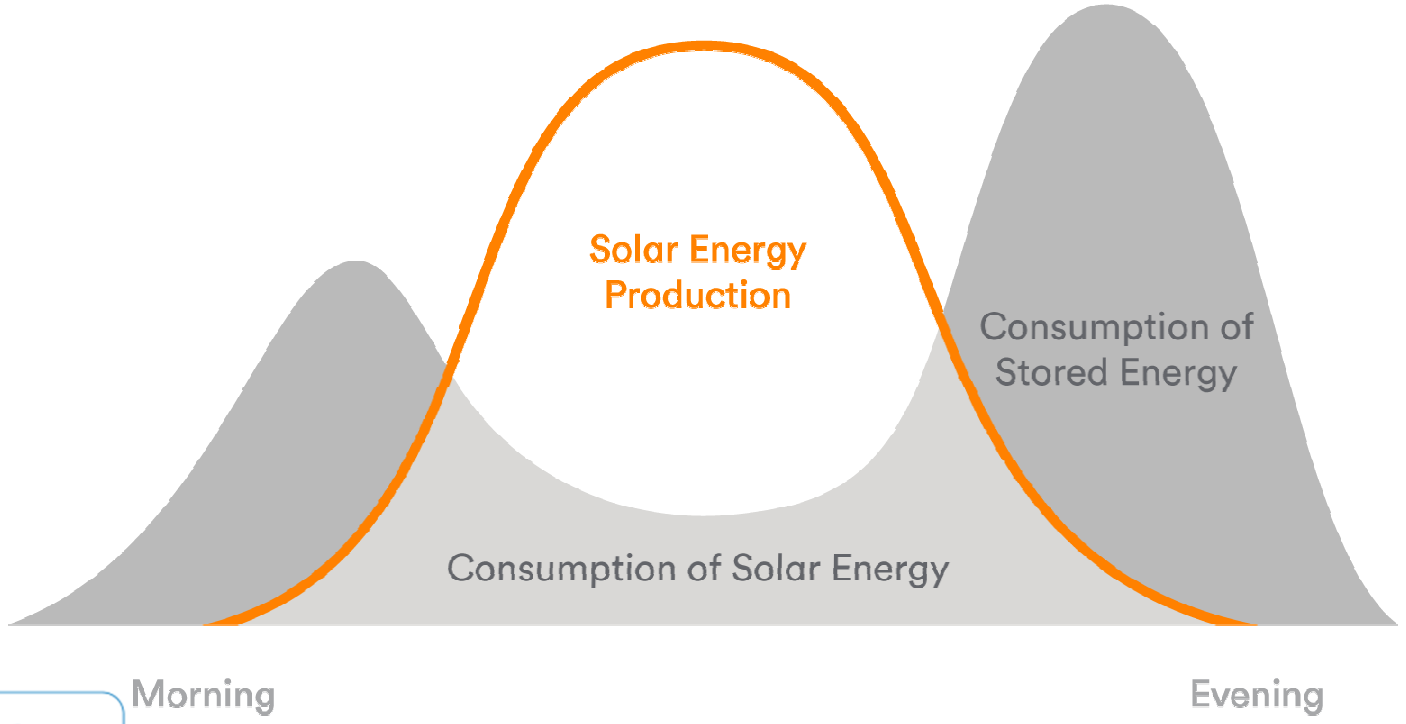
Luke Osborne
Energy and Emerging Technology Solutions Advisor

PEAK CONSUMPTION TIMES- THE NEED TO STORE



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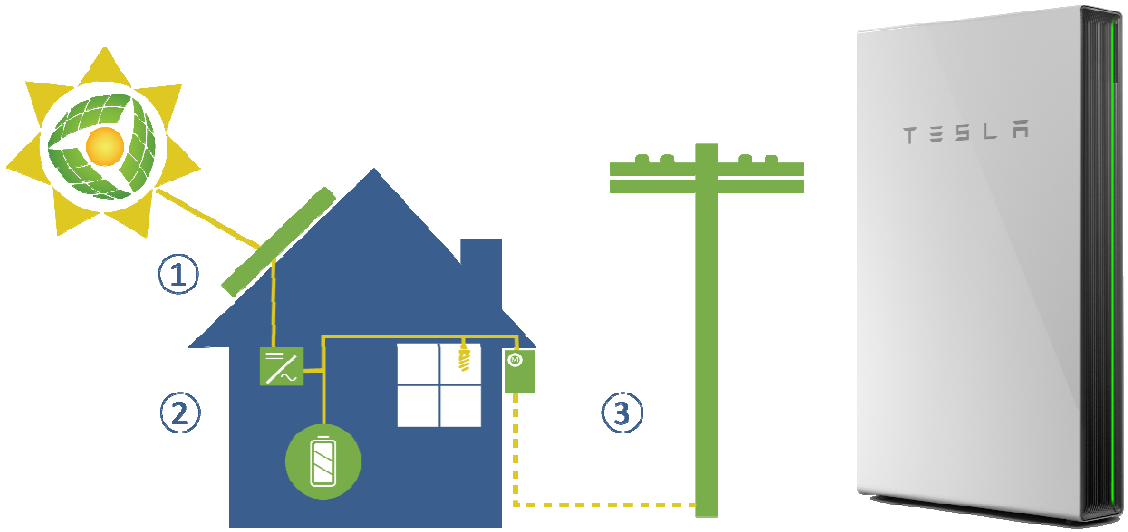
ENERGY STORAGE SOLUTIONS

EES- Electrical Energy Storage

- Time of use tariffs (ToU)
- Aggregation
- AC or DC coupled



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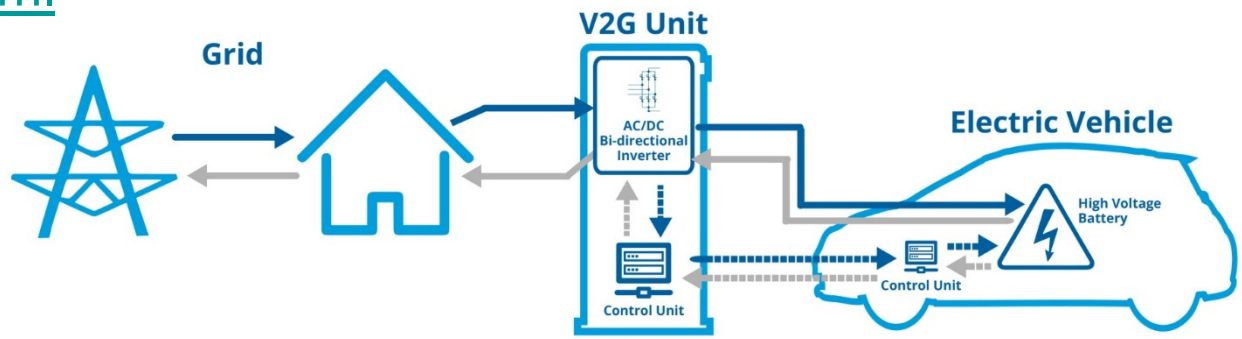
VEHICLE TO GRID CONNECTIONS (V2G)

- The next stage of EVs
- A bi-directional system where energy from the car is fed back to the grid
- https://www.ovoenergy.com/guides/electric-cars/vehicle-to-grid-technology.html



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SMART HOMES

Many of the new technologies work better when they are smart, connected and integrated

BEING SMART ABOUT IT

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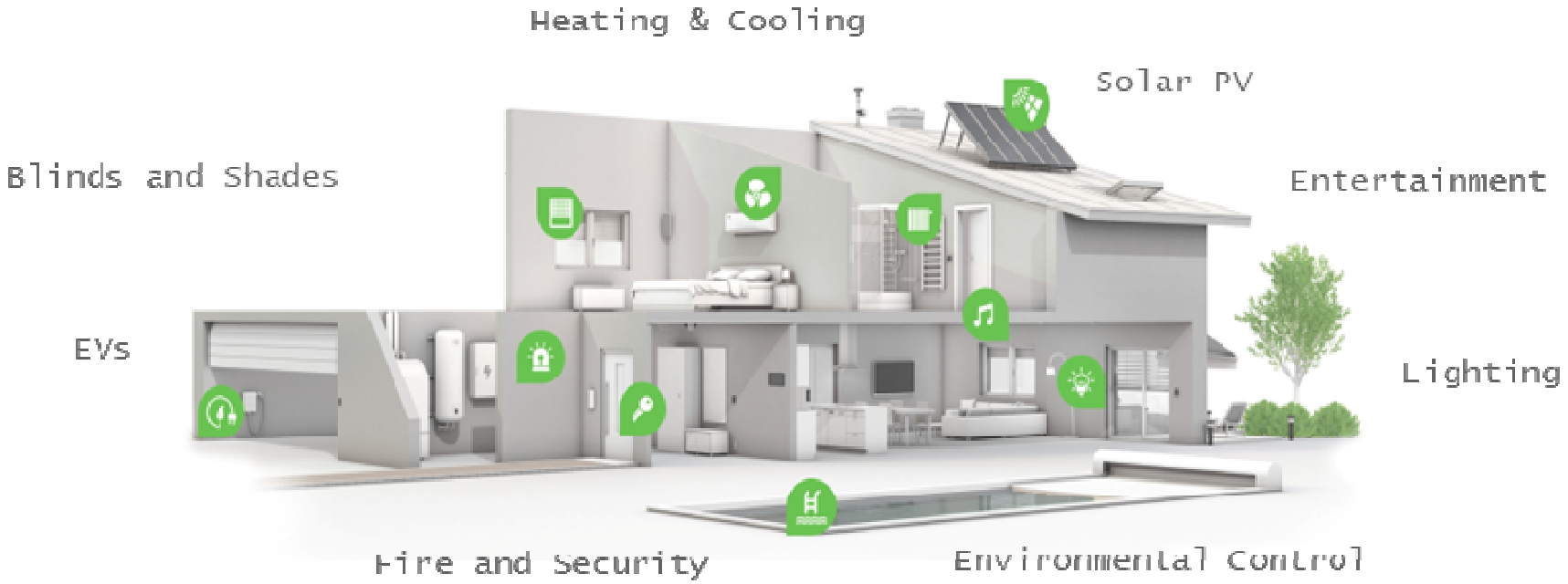
SMART HOME



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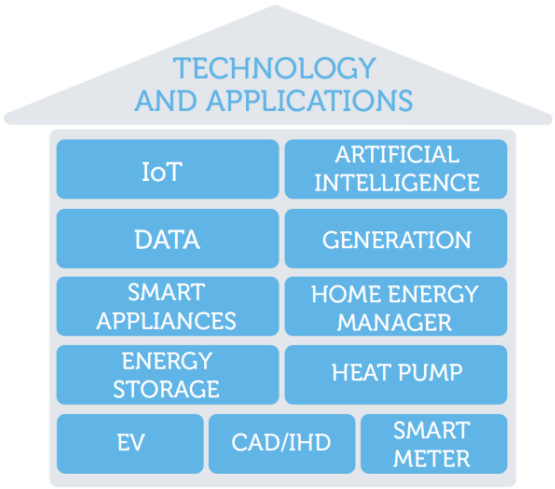
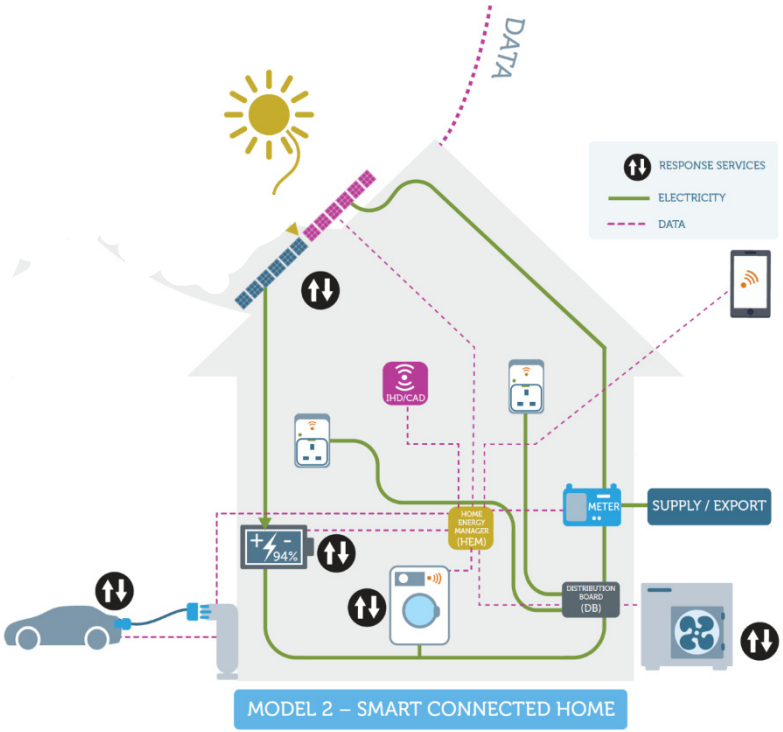
SMART HOME





MODEL 2 – SMART CONNECTED HOME

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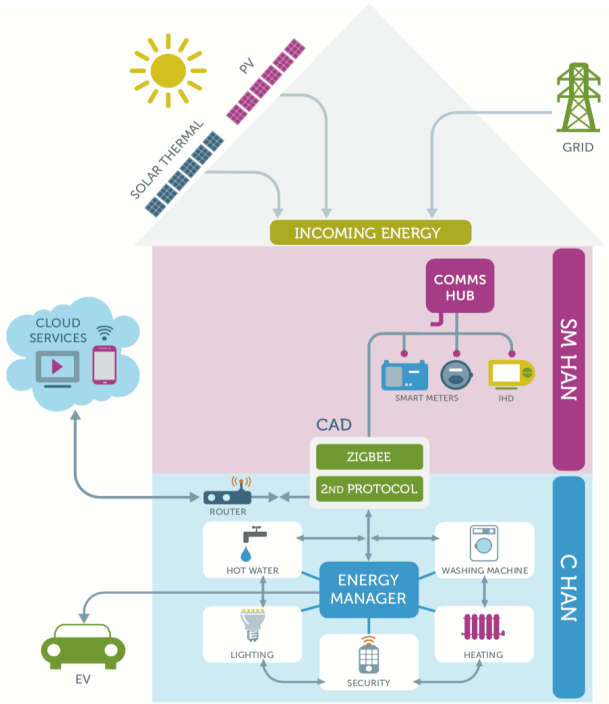
Smart Homes – Technologies & Application

Smart Meter - Home Area Network (SM HAN)

Consumer - Home Area Network (C HAN)



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ENABLING ASSISTED LIVING

- Carer alerts - alert family, friends or neighbours

Appliance tracking – if / when in use

Audible reminders to take medication

Visual reminders - lights flash for visitors

Panic' button - if an incident arises

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Energy and Emerging Technology Solutions Advisor

COMMERCIAL: BACS, BEMS AND BIM

- Building Automation Control Systems BACS
- New name for BMS, and then some
  - Growing sector Encompassing Building Energy Management Systems (B.E.M.S), Building Management Systems (B.M.S.) and Building Information Modelling (B.I.M)
  - Commercial opportunities for the design, installation, monitoring and maintenance of all the above

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Energy and Emerging Technology Solutions Advisor

INDUSTRIAL IOT(IIOT)

- Use for IIoT

  - Energy consumption optimization
  - Industrial security systems
  - Safety and health (conditions) monitoring of workers
  - Predictive and remote maintenance
  - Asset tracking and logistics
  - Data Analytics

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Energy and Emerging Technology Solutions Advisor

BUILDING INFORMATION MODELLING

- Design and Construction teams to communicate
- Whole life cycle of a built asset
- UK Government requirement to tender on Gov. projects since 2016

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INSTALLATION AND TESTING TECHNIQUES

- Non-trip testing
- Thermal imaging
- Web-based / App based ‘inspection and commissioning reports’
- Use the customer
  - Pre-qualification of faults
  - Smart phones / digital cameras / video
- Remote monitoring and error reporting

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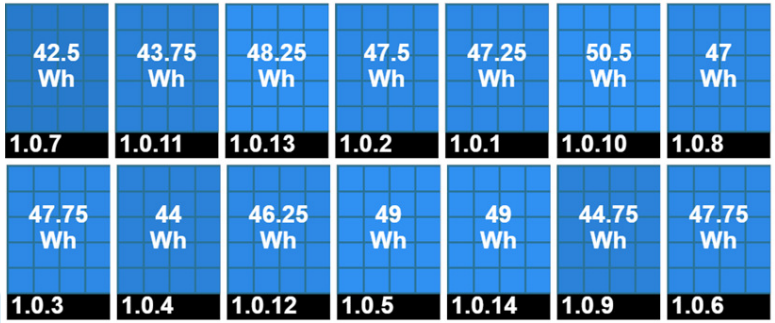
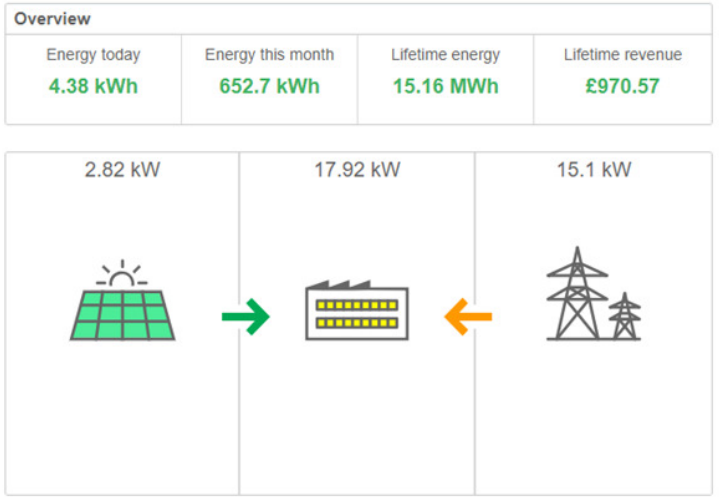
Energy and Emerging Technology Solutions Advisor

REMOTE MONITORING

- Pro-active service
- Exceed customers expectations
- Build into your service model





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Luke Osborne
Energy and Emerging Technology Solutions Advisor

VIRTUAL / AUGMENTED REALITY AND AI

- Augmented reality, the ability to overlay the real-world view
- A field technician can provide video access to a tech support department to enable support in real time
- AI- ENA trialling ‘cut-out’ identification via camera phone

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DRONES, UAVS & REMOTE INSPECTION

- Not just a toy
- Drones can be used for high level inspections, such as lightning protection systems
- Miniature robots can also inspect structure or help to find cable routes etc

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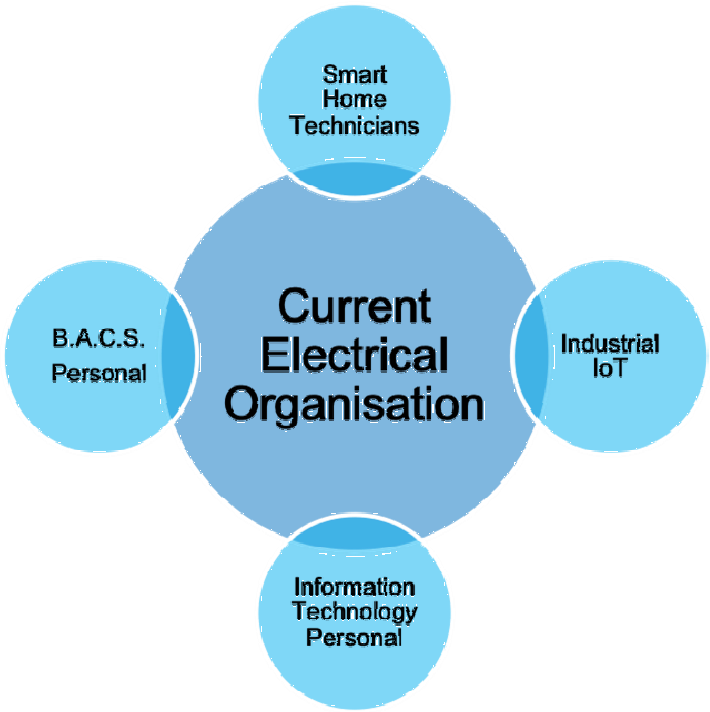
ELECTROTECHNICAL COMPANIES INDUSTRY 4.0

Business's are restructuring

- Skills and Qualifications
- Increasing need for IT
- In-house expertise
- Hybrid structures
- Electrotechnical
- Digitisation



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SUMMARY

- The electrotechnical world is changing
- Sockets and lights will always be needed, but new items and ideas are becoming the norm
- Skills will be needed to install and use these new technologies
- Electrotechnical companies are the facilitators to this brave new world
- We're here to support them

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Questions?

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