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PATRICK ALLCORN

DEPARTMENT FOR BUSINESS, ENERGY AND INDUSTRIAL STRATEGY

MICHAEL GALLAGHER
MIDLANDS NET ZERO HUB

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SESSION 1: POWER, HEAT, TRANSPORT

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JASON HORNER

HILSON MORAN

Hilson Moran

The Electrification of Council Depots – A Guide

October 2022

H|M

Leading international environmental engineering consultancy for the built environment

Industry Advisors & Influencers.

LONDON ENERGY TRANSFORMATION INITIATIVE

CITY OF LONDON

H M Hilson Moran

Electrical engineering for net zero buildings

BBP | BETTER BUILDINGS PARTNERSHIP

TM67: 2021

CIBSE

UK GBC

H M

We are proud to be represented on UKGBC's Renewable Energy Procurement and Carbon Offset Guidelines Task Group

Planning Advice Note

Whole Lifecycle Carbon Optioneering

Net Positive Places.

> Energy and Utilities

> Water and Waste

> Transport and Mobility

> Ecology and Biodiversity

> Air Quality and Pollution

> Expert witness and Strategic Sustainability

Planning for environmentally and socially net positive future places

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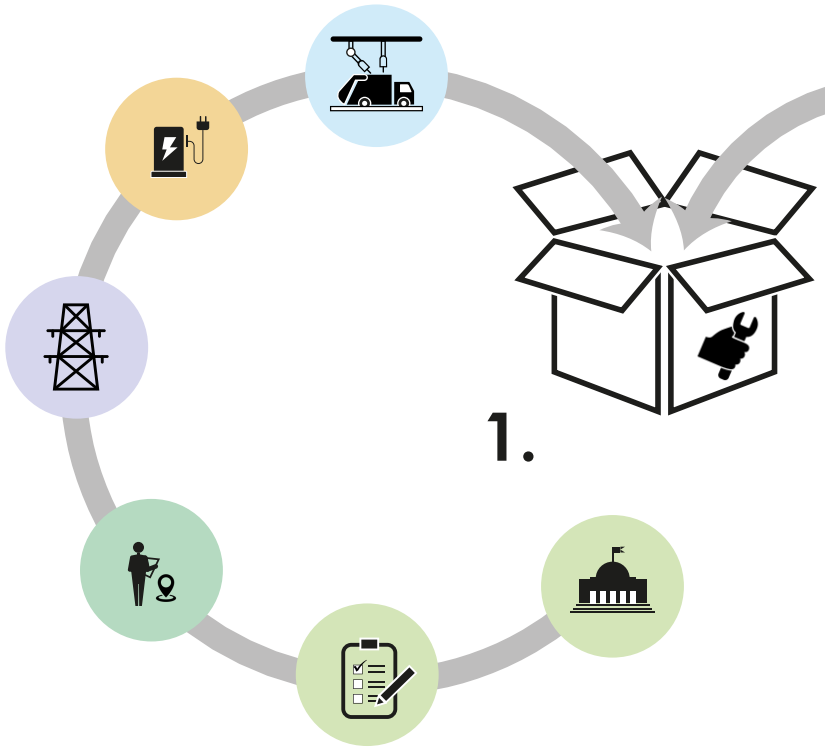
METHODOLOGY.



1.

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Guide

'Making Council Depots Electric Fleet Ready '

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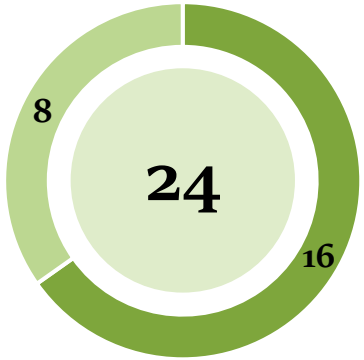
SURVEYS.

Local Authorities participating to the survey.

Local Authorities

67

Responses



Vehicle fleet depot visit

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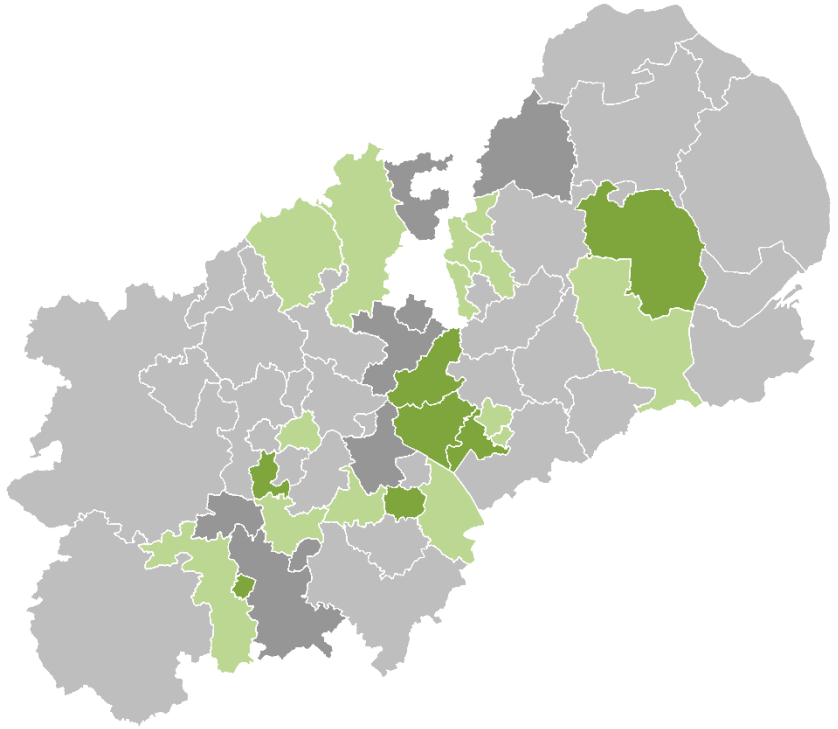

- No contact data available
- No response
- Full response with additional information
- ‘Quick’ or alternative responses with key information

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SURVEYS.

Fleet vehicle depots archetypes.

SMALL

North Kesteven Depot, Metheringham

Typical newer **rural** depot with dedicated parking for all vehicle types which leads itself to implementation of EV Charging.

MEDIUM

Whetsone Depot, Leicester

Typical **semi urban** depot with dedicated parking for all vehicle types which leads itself to implementation of EV Charging.

LARGE

Whitley Depot, Coventry

Typical **urban** multi use depot with large number of vehicles with congested double or triple parking arrangement.

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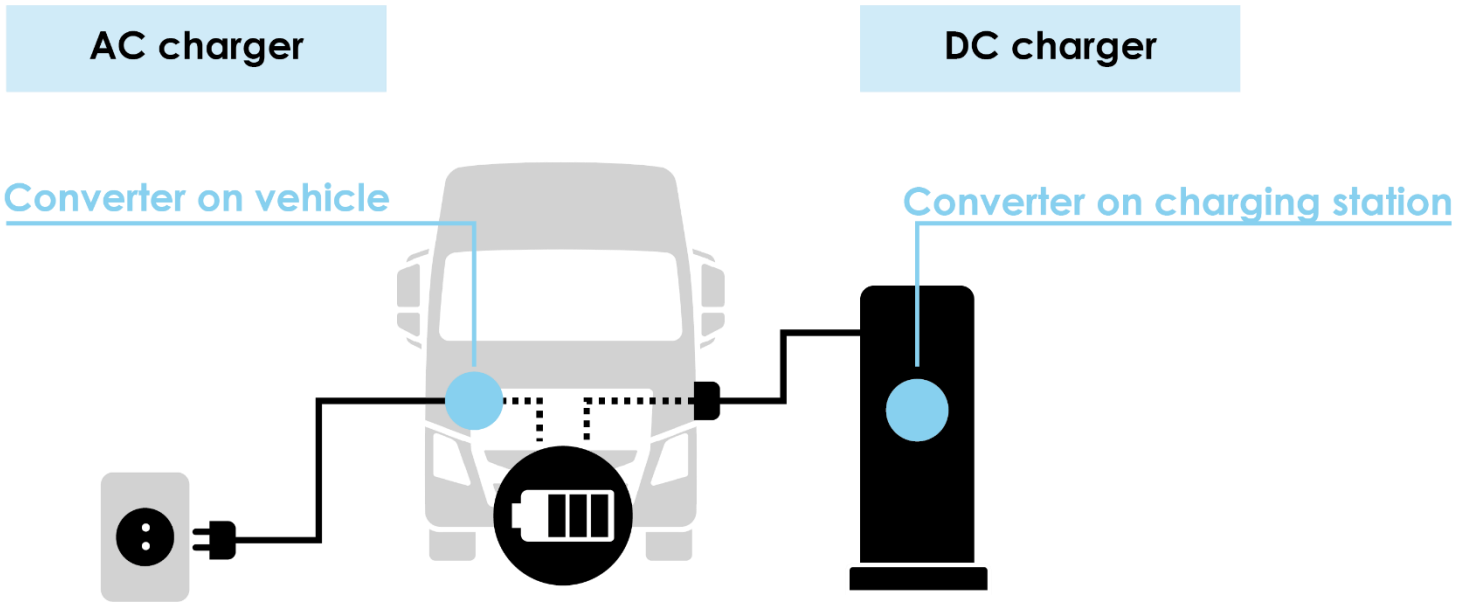
VEHICLE MANUFACTURER.

Electric vehicle on-board/off-board charging.



VEHICLE MANUFACTURER.

Vehicle manufacturers consulted.

BUNCE

DAF

DENNIS EAGLE

JCB

VOLVO

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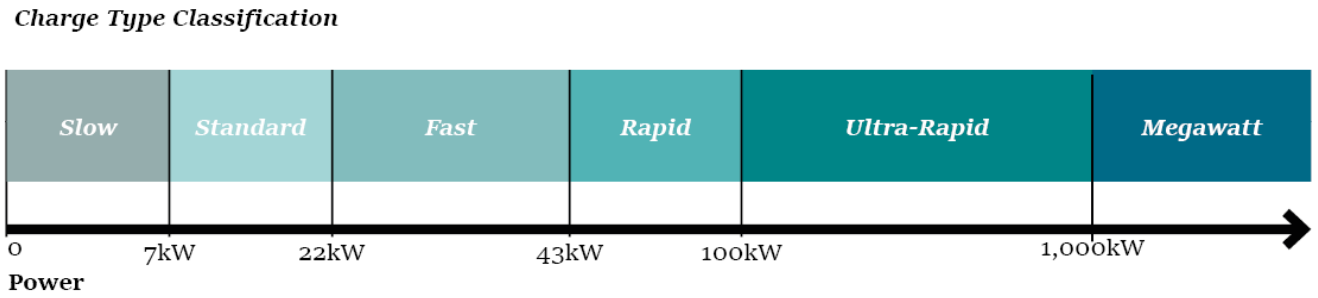
ELECTRIC VEHICLE CHARGING POINTS.

Range of ECVP suppliers/ChargePoint Operators consulted.

Manufacture and Supply (Hardware and Software)	**Supply**
Plan, Design and Install	**Supply/Design**
Operate and Maintain (ChargePoint Operators – CPOs)	**Install, Operate, Maintain**
Managed and Funded Services (CPOs)	**All**



ABB

KEMPOWER

JOJUSOLAR

bp pulse

swarco

eo

CONNECTED KERB

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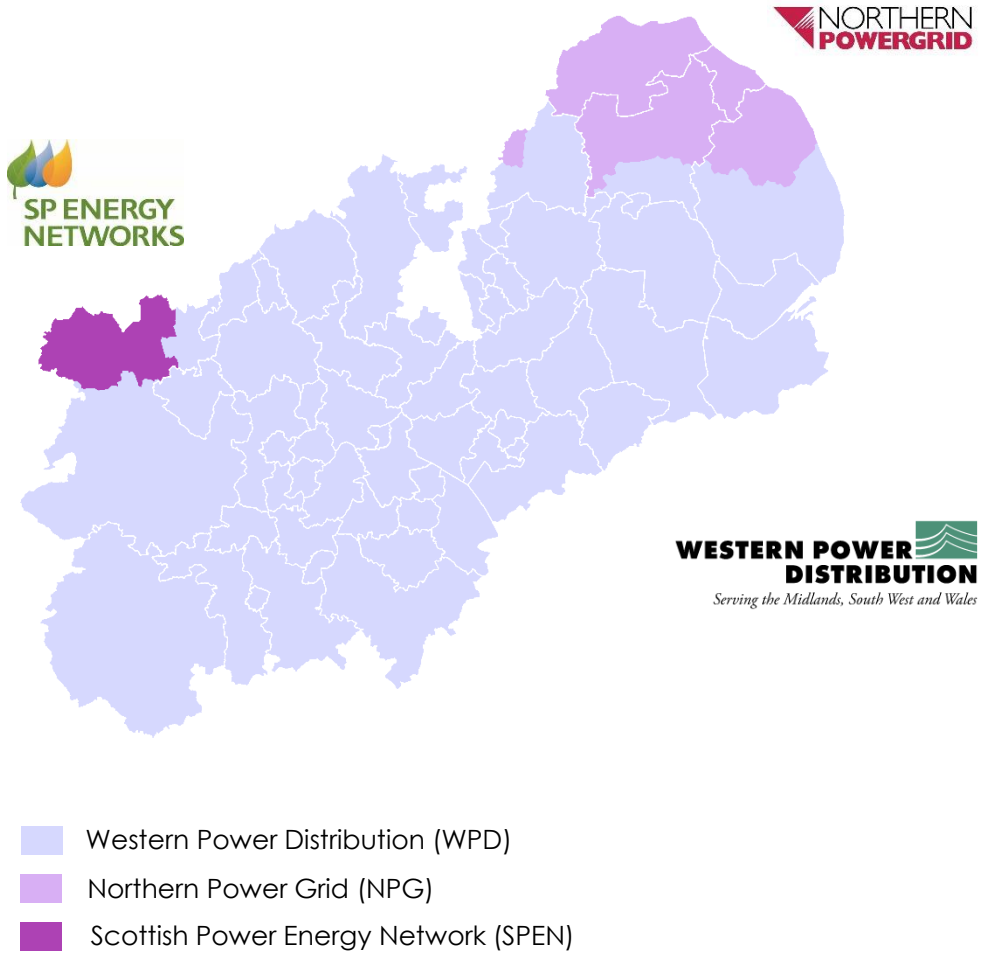
DISTRIBUTION NETWORK OPERATORS.

- A DNO owns and operates Britain's electricity infrastructure at low-voltage (LV – 415 volts) through to extra-high-voltage (EHV - up to 132,000 volts).
- Western Power Distribution covers majority of Midlands (with SPEN and NPg the fringes).
- Each DNO has their own (variant) EV connections guides, online data portals and heat maps and risks.
- HM have so far met with all 3 DNOs.
- HM to meet with IDNO next week (ESP).



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YOUR GUIDE.

MIDLANDS NET ZERO HUB

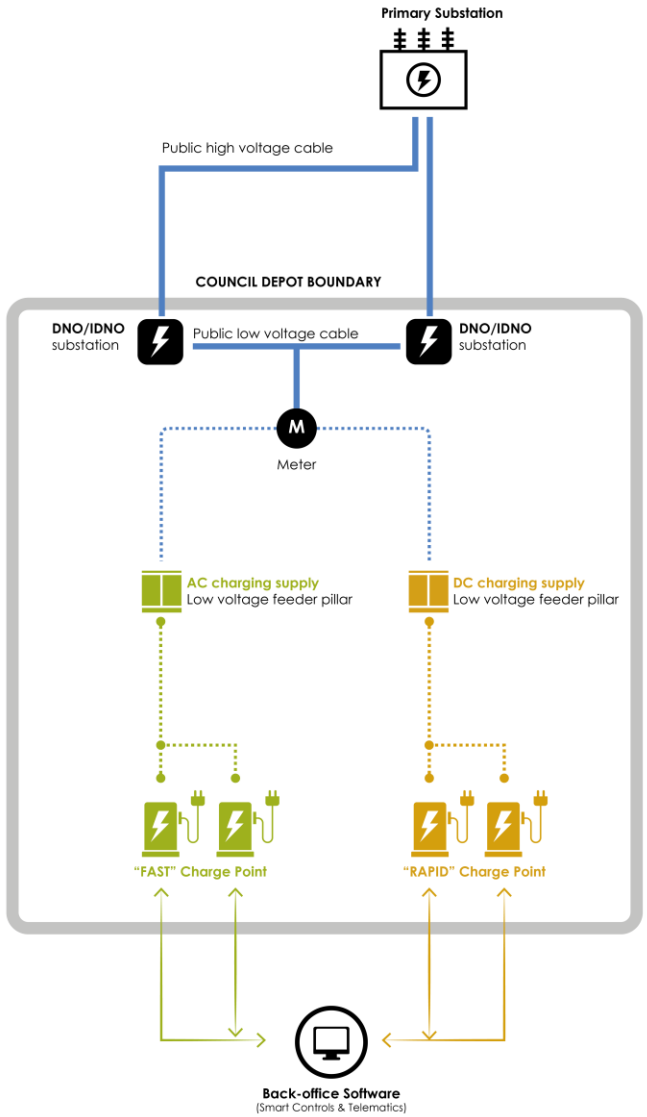
Hilson Moran

The Electrification of Council Depots.

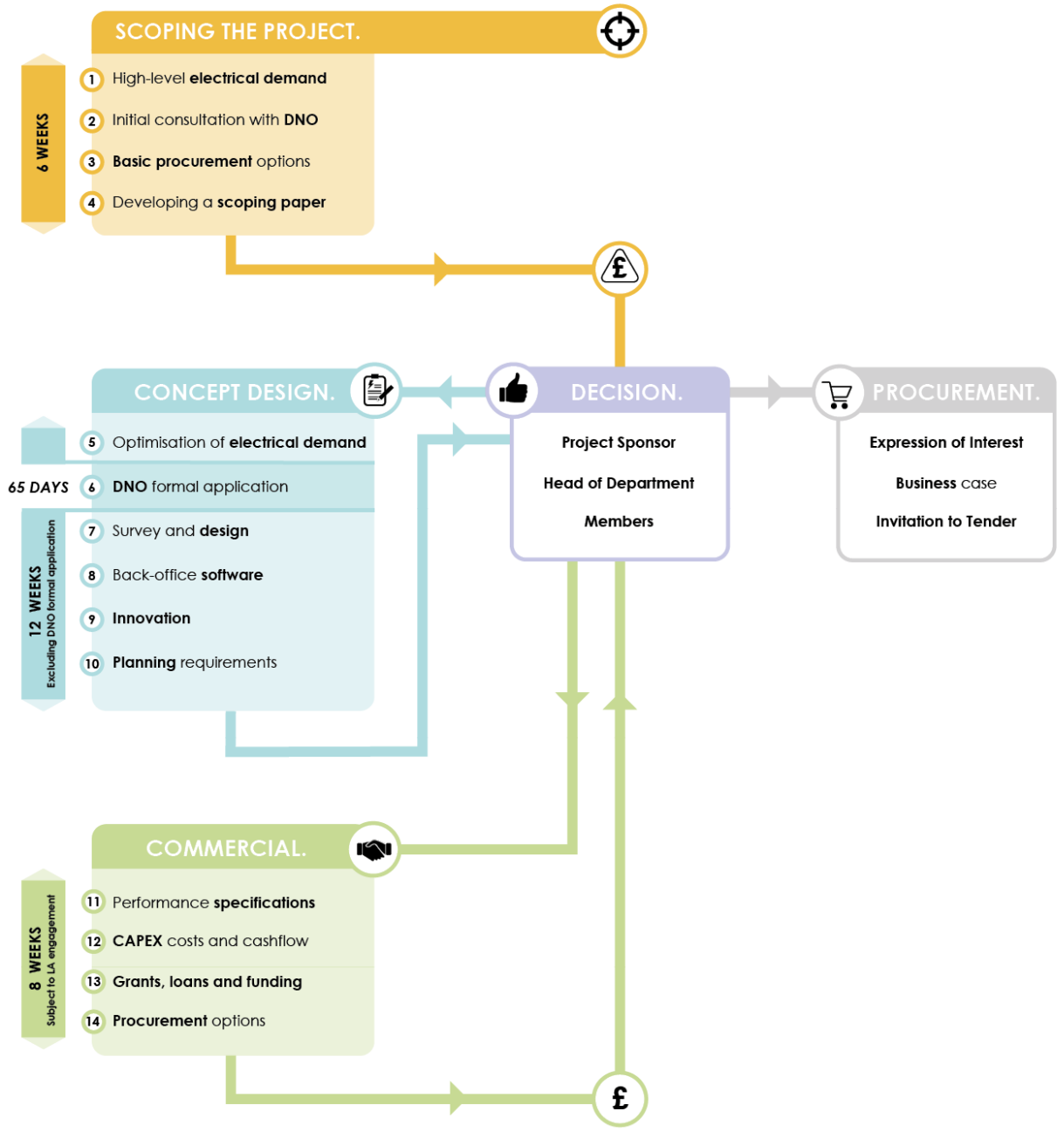
A Guide to making Local Authority depots ready for fleet electrification.

EXPLAINERS.

- What is the “electrical demand”
- How are EV batteries measured?
- Energy versus Power?
- What is a DNO?
- HV vs. LV infrastructure
- Non-Contestable vs. Contestable DNO works
- AC vs. DC charging
- Optimising charging cycles
- What is an ICP (Independent Connections Provider)?
- What is an IDNO (Independent DNO)?
- What is the Second-Comer Rule?
- What is back-office software?
- Communication protocols (OCPP and ISO15118)



THE PROCESS.



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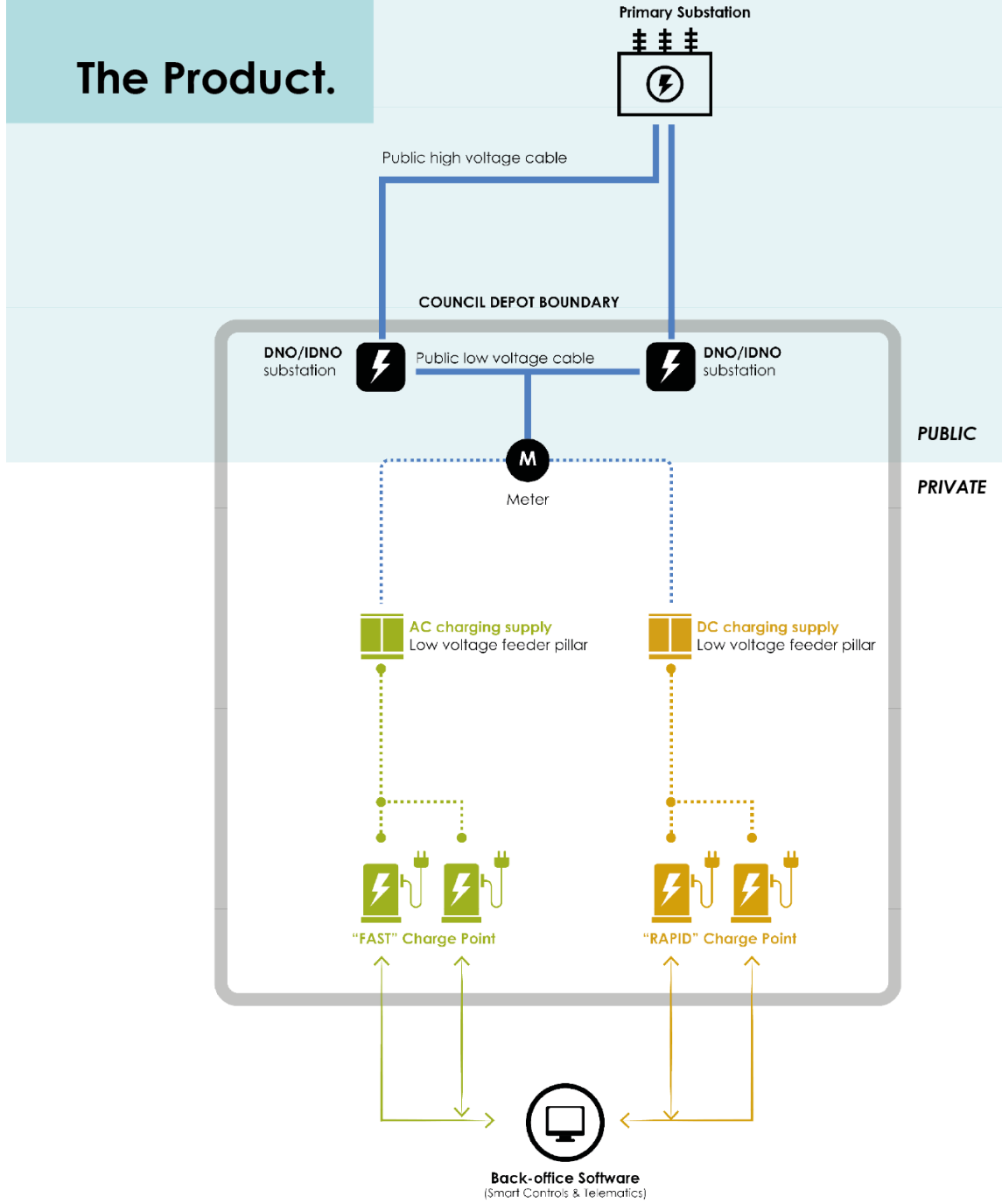
THE PRODUCT.

The Product.



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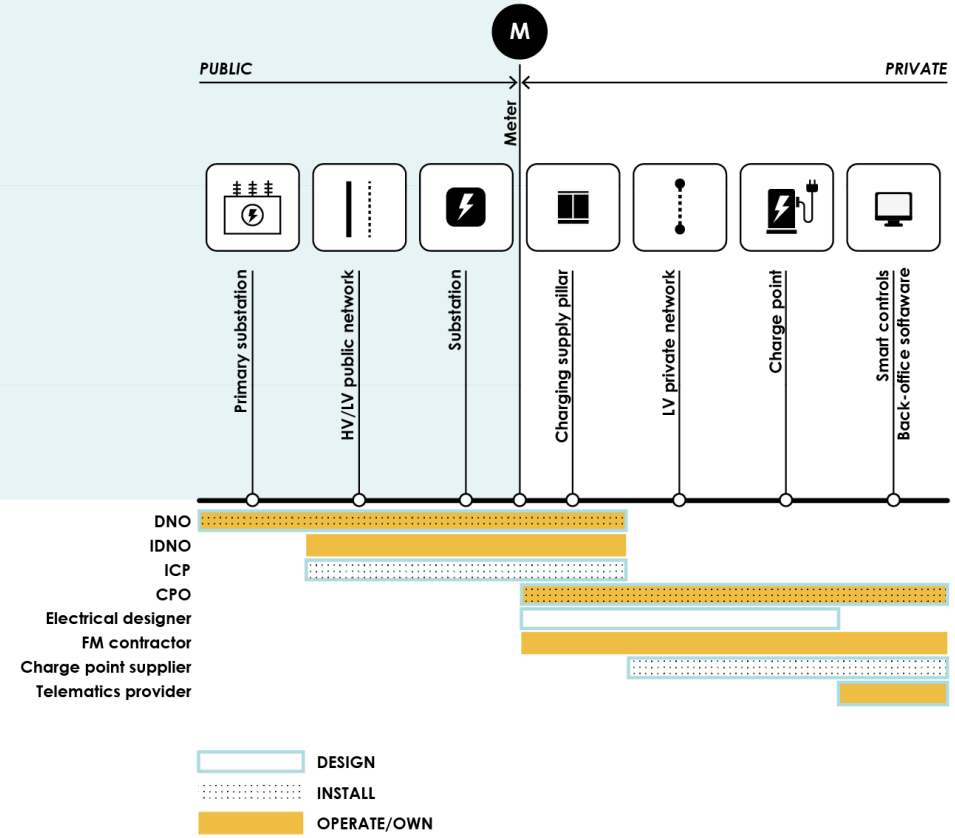
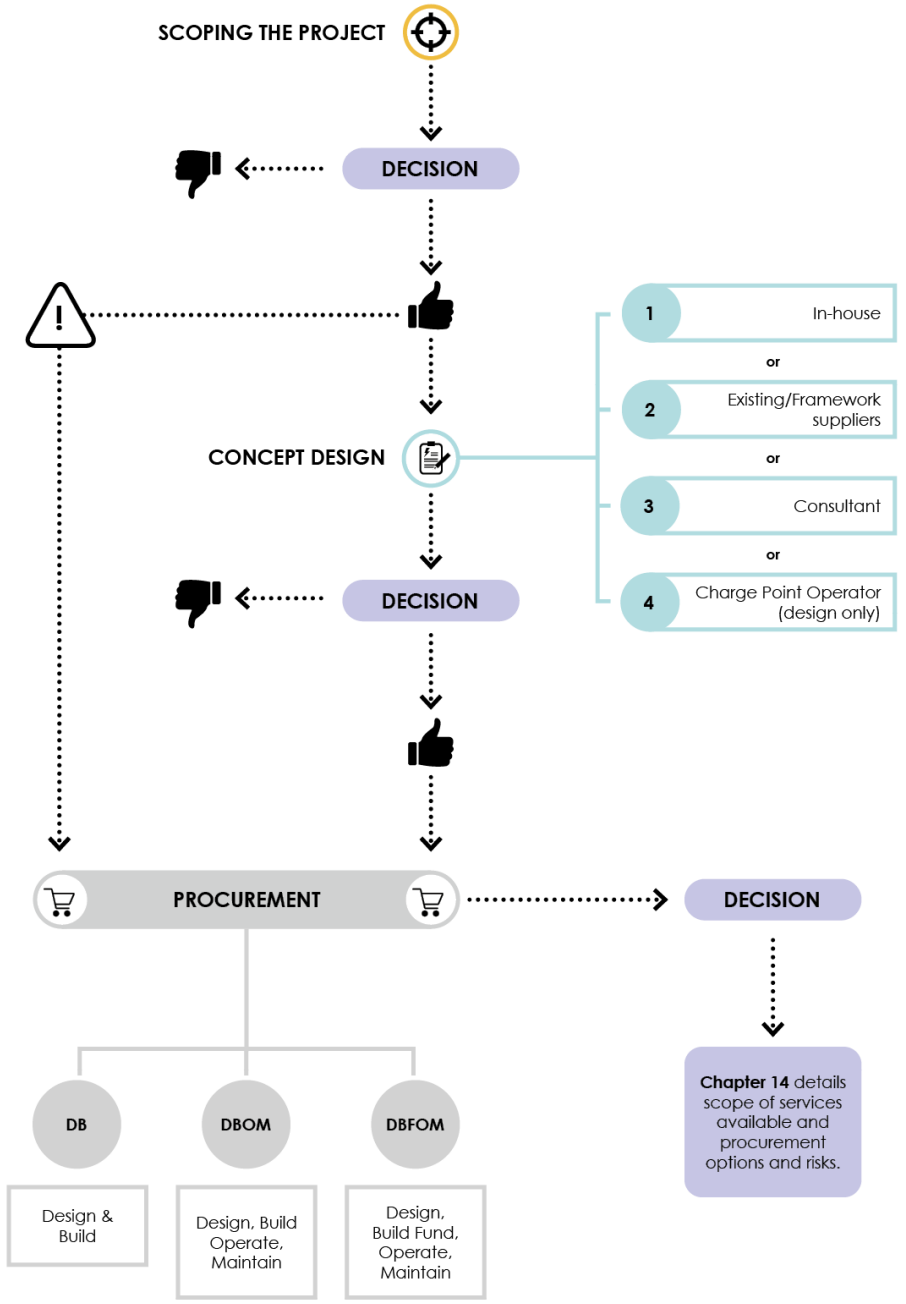
THE PLAYERS.

The diagram below defines the 'players' and their role in the delivery, ownership and operation of the EVCI that is required to operate a fleet of BEVs with a Local Authority depot.



YOUR CHOICES.



Market response likely to be more variable in quality if design and specifications are not well developed.

SCOPING THE PROJECT.

Electrical demand estimation

Vehicle type	Number of vehicles		Vehicle battery size		Battery storage	Dwell time	Power demand	Power correction factor	Apparent power demand
	No		kWh		kWh	hours	kW	n/a	kVA
RCV	14	x	300	=	4,200	4:30pm to 6:30am			
Large/small van	40	x	75	=	3,000				
Sweeper	2	x	55	=	110				
Other HGV (>15 tonnes)	3	x	282	=	846				
Total					**8,156**	**÷ 14**	**= 582.6**	**÷ 0.9**	**= 647.3**

Budget cost estimation

Off-site works

'Contestable' works - HV extension	£50,000

647kVA connection from HV network

On-site works

On-site contestable HV/LV	£75,000
Civil works	£65,000
LV EVCP distribution infrastructure (**59 vehicles**)	£26,550
EV AC Charging Points (14 RCV+ 3 HGV)	17 x £3,500
EV AC Charging Points (42 others)	42 x £1,500

£339,050 *

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CONCEPT DESIGN.

Headline Scope & Risk Items

- Determining the maximum electrical demand and engaging with the DNO for an electrical supply.
- Planning and surveying new Substation, meter/switchroom, feeder pillar and charge point locations during the concept design.
- Planning and surveying cabling routes including carrying out ground penetration radar survey and reviewing existing record documentation to establish existing buried services.
- Review RC59 'Fire Safety when charging electric vehicles' and assess any fire risks relating to the proposed concept design and consider any necessary mitigation works.
- Review any Health and Safety issues with the concept design and consider any necessary mitigation works.
- Establishing any local planning requirements for new substation and meter/switchroom enclosures.
- Establish any third party agreements required for the proposed concept design.
- Establish any legal lease and easement agreements with the DNO for the proposed concept design Substations and HV cabling routes .

Electrical demand calculation

Indicative Blueprint 2 - Medium Site

Vehicle type	Number of vehicles	Number of chargers	Charger Type		Number of vehicles charging per day		Number of charging period (24 hours)	Peak		Power correction factor		Power demand
	No	No	kW		No		No	kW		n/a		kVA
RCV	14	11	22	x	11	÷	1	242	÷	0.90		269
Large/small van	40	40	7	x	20	÷	2	70	÷	0.90		78
Sweeper	2	7	7	x	4	÷	2	14	÷	0.90		16
Other HGV (>15 tonnes)	3	3	22	x	3	÷	1	66	÷	0.90		73
RCV/General	n/a	3	50	x	3	÷	1	75	÷	0.90		83
Total								**467**	÷	**0.9**	=	**519**

CONCEPT DESIGN.

DNO or IDNO HV to LV substation

GRP enclosure for Low Voltage switchboard serving EVCI and utility meter

LV feeder pillar serving group of charging posts

LV supply from DNO or IDNO substation serving Low Voltage switchboard

Primary LV Sub-Main buried ducted cable routes serving feeder pillars

LV Buried Sub-Circuit cabling serving charge posts from feeder pillar

50 kW DC charger

22 kW AC charger

7 kW AC charger

Charger

NOTE 1: 3 no. 50kW DC charging points are added to the worked example in place of 3 no. 22kW AC charging points for illustrative purposes only. These might be used to charge RCVs overnight but produce flexible rapid charging services during the day for other fleet vehicles.

NOTE 2: DC charging posts are significantly larger than AC charging posts because they have an in-built rectifier converting AC to DC (sometimes this is within a separate power unit feeding multiple posts).

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PROCUREMENT OPTIONS.

PROJECT MANAGEMENT

- Interface with DNO and energy supplier
- Planning submissions and all necessary consents
- Interoperability testing between vehicle/EVCP manufacturers
- User training and development

DESIGN & INSTALL

- Duty cycle need, dwell time, load management and maximum demand optimisation
- Detail design development and specification
- Phasing/sequencing and costs
- Contract and programme
- Installation, testing and commissioning

OPERATION & MAINTENANCE

- Planned Preventive Maintenance (PPM)
- Emergency field operative call-outs and time to repair
- Electrical safety inspections
- Spare charge points / Spare parts
- Vandalism cover
- Penalties for inoperable plant
- Remote fault diagnosis (back-office software)
- Remote fault protection (back-office software)
- Static/Dynamic load management and optimisation

ADMINISTRATION & BILLING

- Billing for on-site charging
- Management reports (Telematics, Energy/Carbon and Costs)
- Billing for off-site charging (if applicable)
- Billing for remote charging (if applicable)

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RISK & OPPORTUNITIES.

High-voltage Infrastructure

The operation and maintenance of HV infrastructure is more specialist and expensive than operating LV infrastructure.

The maximum demand associated with an all-electric depot may require a HV infrastructure. A HV metered connection may provide the best value solution from a DNO/IDNO/ICP perspective but this means that the downstream HV network and distribution substations are privately owned and operated by the depot. One or more LV metered connections might be considered so that the HV distribution and substations are DNO/IDNO owned and operated and should certainly be considered as an alternative.

System Optimisation and Energy Efficiency

The maximum electrical demand needs to be reduced to avoid costly 'Availability Charges'.

Back office software should be specified which incorporates system optimisation including static and dynamic load management and telematics software. Back-office software can be operated by Local Authority personal with training.

Extended charging services

While providing EV charging points at depots will enable charging of the municipal fleet parked at the depot there could be fleet vehicles which are home-parked and require charging.

If a CPO is already providing charging at other council sites, or public charging programmes then a design and install service, a managed service, or a funded service can be added to this existing contract.

Equally the depot charging infrastructure could trigger the procurement of charging infrastructure (or services) to vehicle operator homes, staff car parking and/or visitor parking spaces.

Funded service transactions and point of sale

If a CPO is contracted to provide a funded vehicle charging service and charges the Local Authority based on energy used (metered electricity) then the CPO has no incentive to ensure the fleet is operated efficiently, conversely it is more profitable to the CPO if driver behaviour and fleet logistics are such that energy use increases.

Ensure that the transaction for the CPO point of sale is per vehicle duty-cycle and therefore CPO profitability increases the less energy that a vehicle uses and the CPO should proactively undertake driver and fleet operator training.

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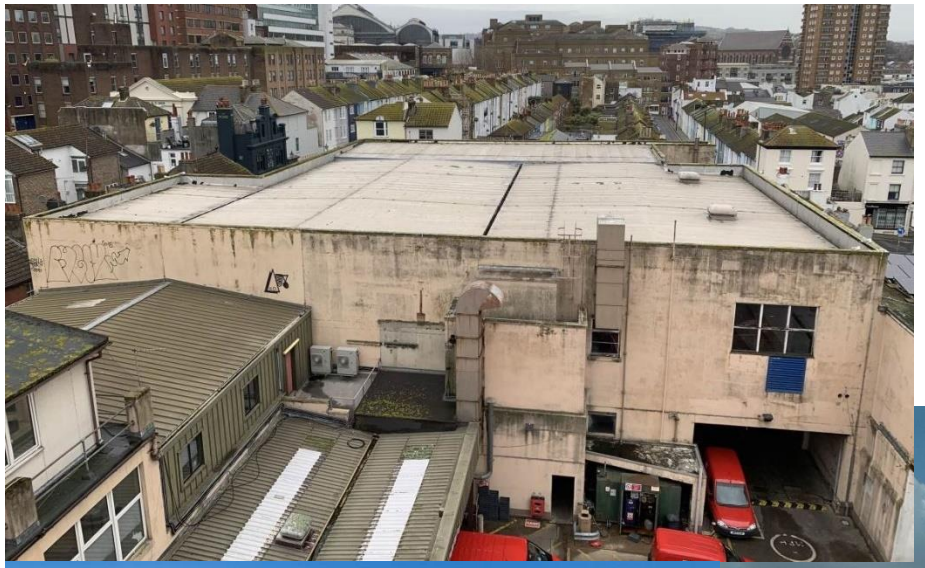
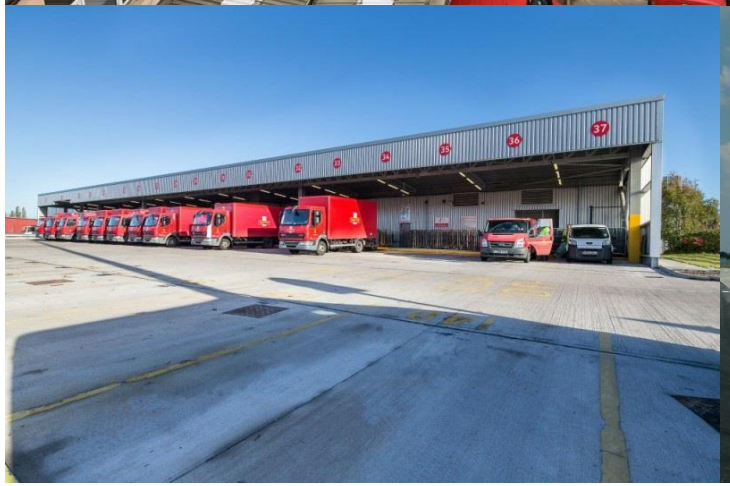
EXEMPLAR CASE STUDIES – ROYAL MAIL.





- 74 sites identified
- Surveys and feasibility studies undertaken
- Available capacity assessed
- Identification of locations for first 3000 BEVs
- 71 sites completed ahead by April 2022

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> We are separately doing two Local Authority ‘Roadshows’ in the East and West Midlands – hopefully within a Council Depot - where we will go into much more detail.

MIKE WOOLLACOTT

GREEN WATT

Working with Midlands Net Zero Hub

Innovation Alliance West Midlands / IZCWG
Rural Community Energy Fund
Farm of the Future: Journey to Net Zero

Greenwatt
...sustainable solutions

Mike Woollacott
Greenwatt Technology

Farm of the Future: Journey to Net Zero

Report Aims:

- RASE follow up report to 2014 'Refuelling the Countryside'
- Highlights challenges of rural decarbonisation
- Identifies policy gaps (pre 2030)
- Examines 'enterprise journeys' – dairy, meat, cereals, hortic.
- 30+ authors/contributors from academia/industry

ROYAL AGRICULTURAL SOCIETY of ENGLAND

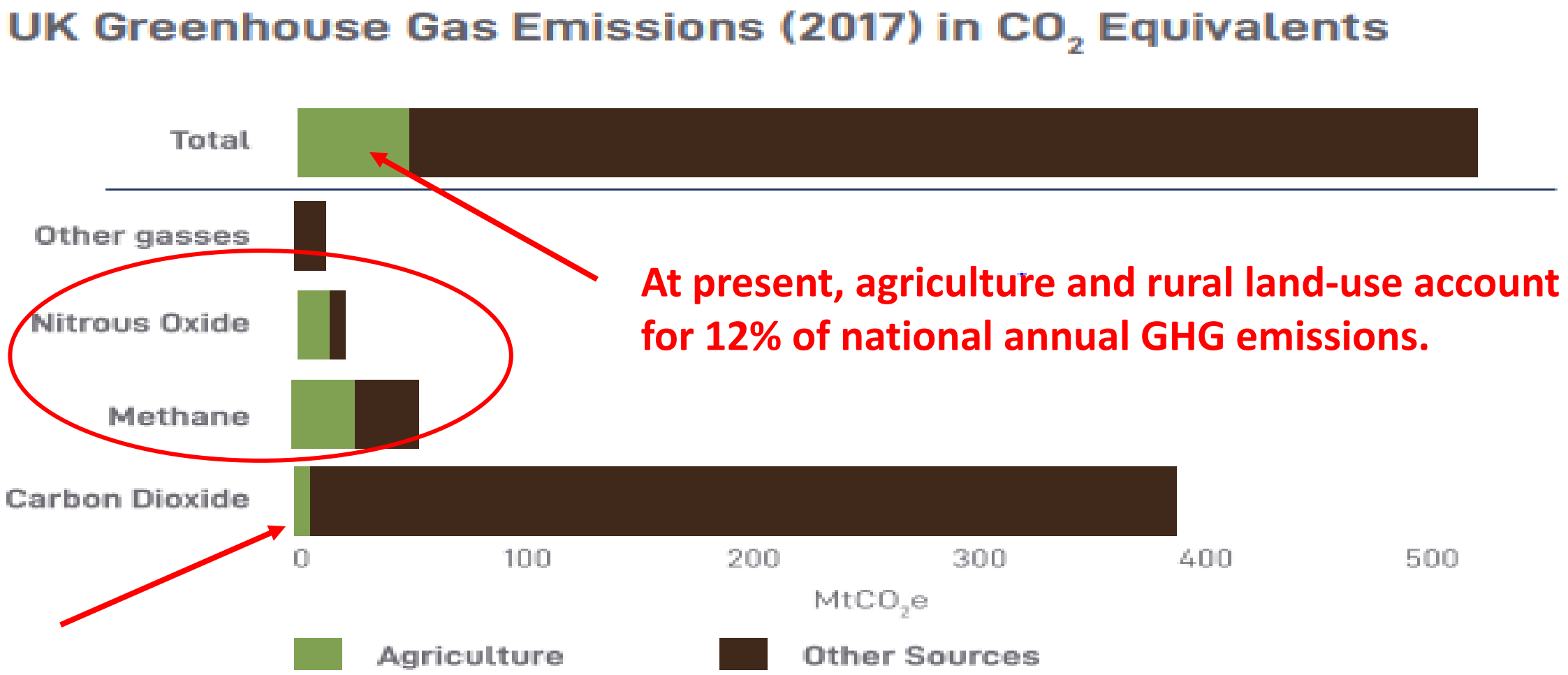
www.rase.org.uk/reports

Sponsors and Editorial Group

Farm of the Future: Multiple Challenges

- Maintaining farm and rural incomes
- Post-Brexit changes: CAP to ELMS; labour shortages
- Balancing environmental land management with food security
- Reliance on high carbon fuels (i.e. red diesel and heating oil)
- Weak rural digital connectivity
- Reducing Greenhouse Gas Emissions (CO_2, **Methane, NO_2)**

Greenhouse Gas Emissions – UK agriculture



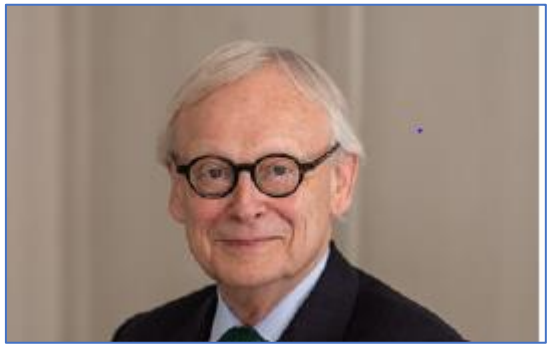
At present, agriculture and rural land-use account for 12% of national annual GHG emissions.

Source: *Defra - The future farming and environment evidence compendium 2019*

Farming's transition to low carbon production

The primary function of farmers is to produce food. Farmers are responsible for managing 71% of the UK landmass and will play a vital role in the implementation of the UK's emissions reduction plans by:

- **Protecting rural resources** (land & water) while enhancing natural capital
- **Decarbonising agri-food supply** including on-farm, zero carbon energy supply via renewables
- **Adopting regenerative agriculture -** enhanced soils management**,** carbon sequestration & biodiversity
- **Transitioning to low emission vehicles** and using non-fossil fuels & powertrains

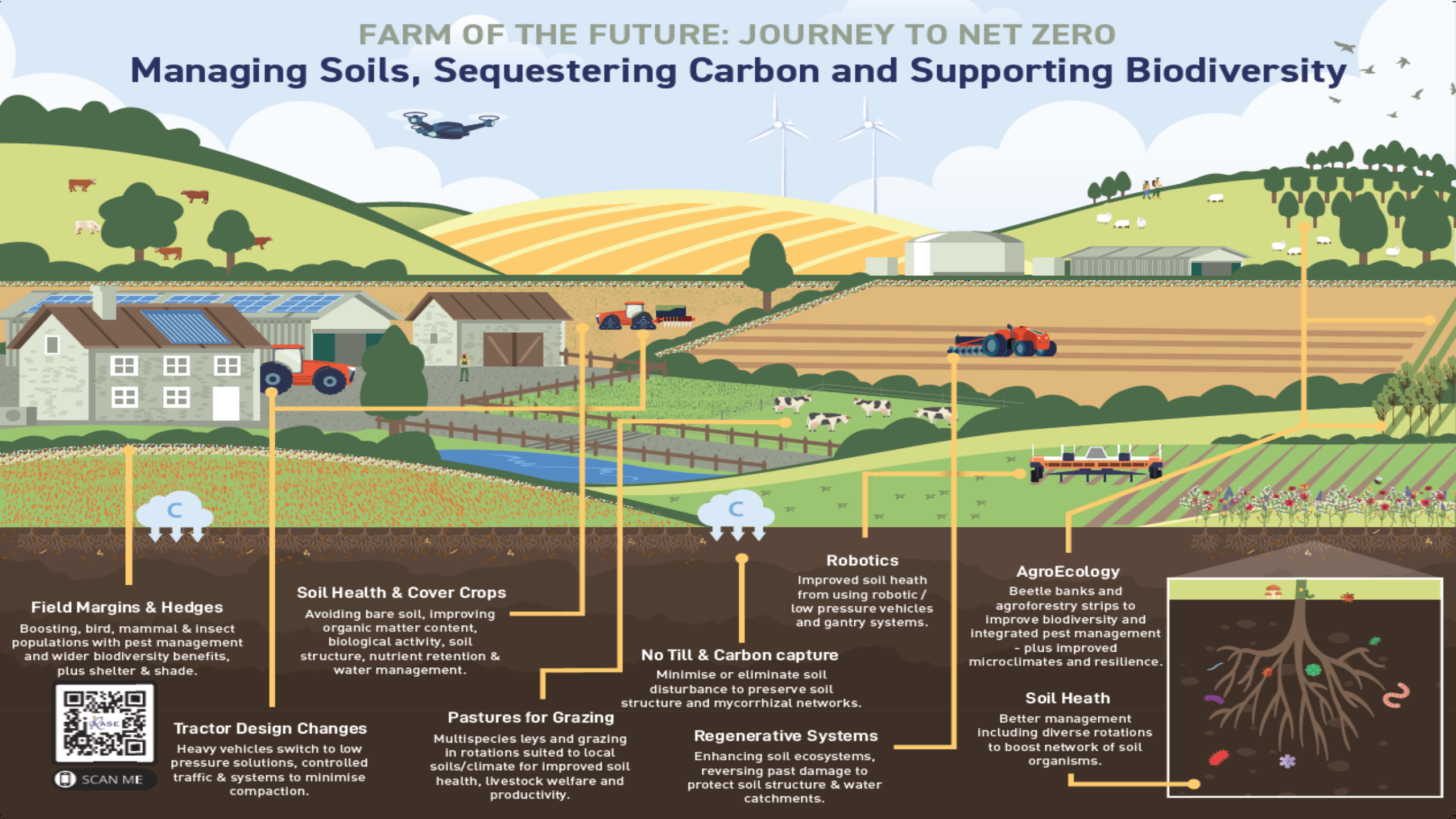


"There is no way in which we can win the battle against climate change unless we recognise the central role which agriculture must play."

Lord Deben - CCC

FARM OF THE FUTURE: JOURNEY TO NET ZERO

Managing Soils, Sequestering Carbon and Supporting Biodiversity



Field Margins & Hedges

Boosting, bird, mammal & insect populations with pest management and wider biodiversity benefits, plus shelter & shade.

SCAN ME

Tractor Design Changes

Heavy vehicles switch to low pressure solutions, controlled traffic & systems to minimise compaction.

Soil Health & Cover Crops

Avoiding bare soil, improving organic matter content, biological activity, soil structure, nutrient retention & water management.

Pastures for Grazing

Multispecies leys and grazing in rotations suited to local soils/climate for improved soil health, livestock welfare and productivity.

No Till & Carbon capture

Minimise or eliminate soil disturbance to preserve soil structure and mycorrhizal networks.

Regenerative Systems

Enhancing soil ecosystems, reversing past damage to protect soil structure & water catchments.

Robotics

Improved soil heath from using robotic / low pressure vehicles and gantry systems.

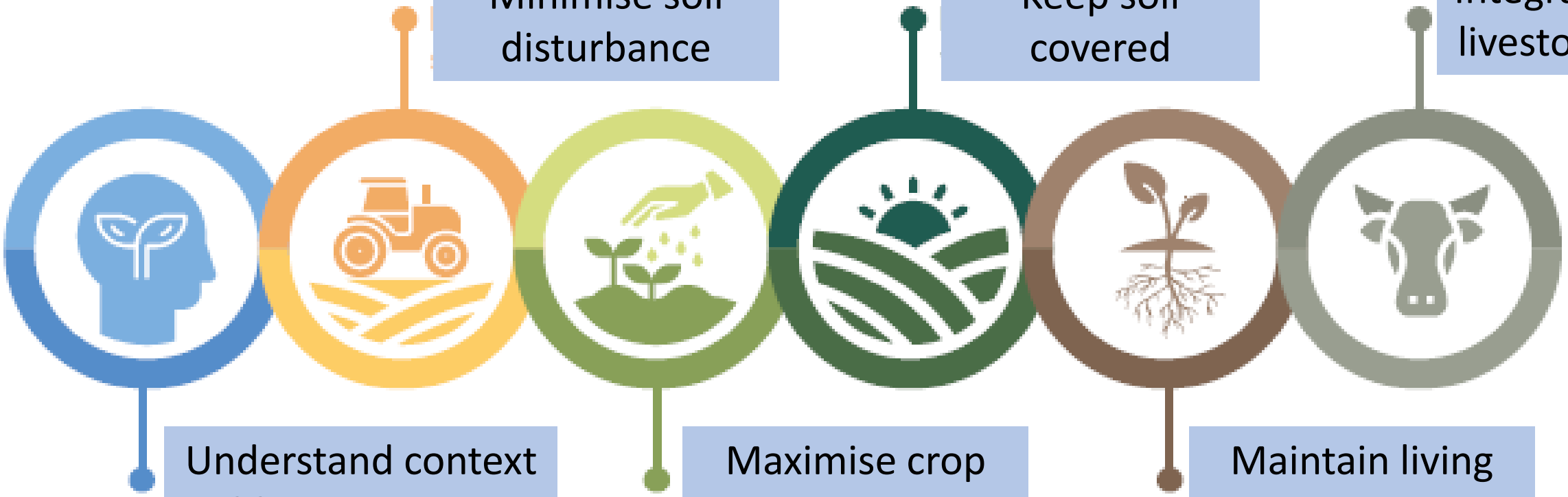
AgroEcology

Beetle banks and agroforestry strips to improve biodiversity and integrated pest management - plus improved microclimates and resilience.

Soil Heath

Better management including diverse rotations to boost network of soil organisms.

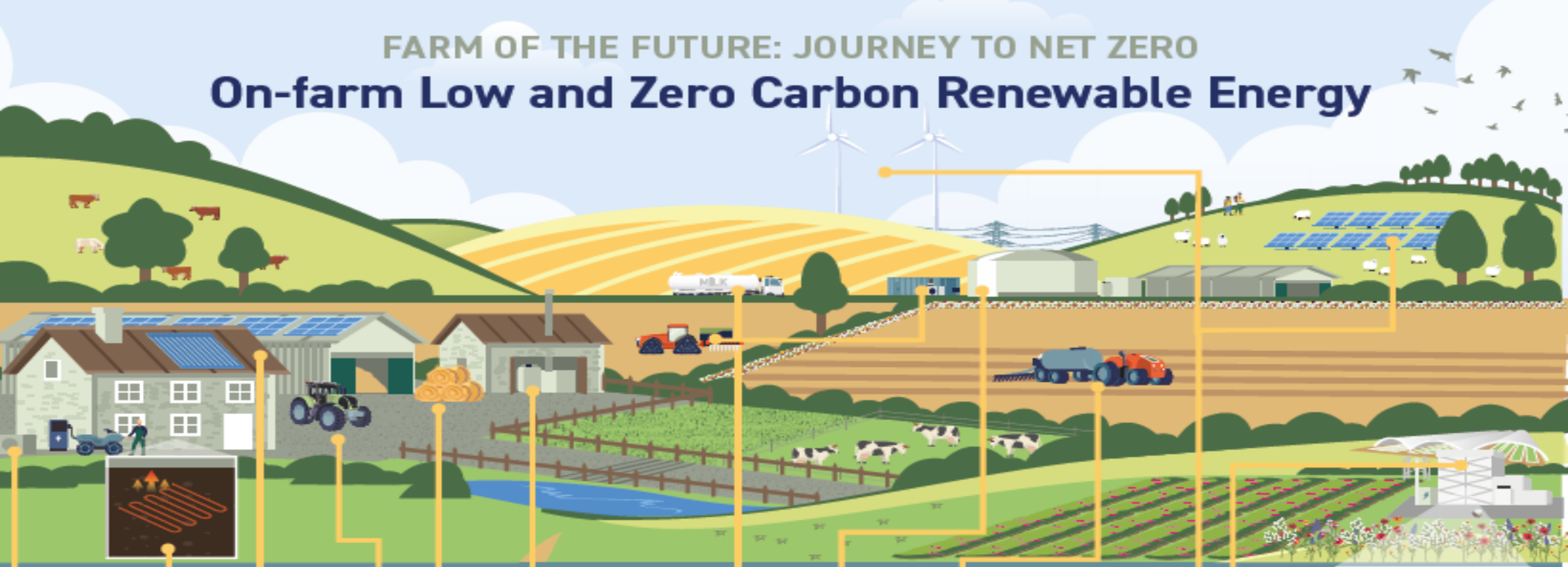
Core principles of regenerative agriculture



Graphic courtesy: Paul and John Cherry, Groundswell

FARM OF THE FUTURE: JOURNEY TO NET ZERO

On-farm Low and Zero Carbon Renewable Energy



Rural Heating

Heat pumps - Air / ground / water source heat pumps to supply heating (and potentially cooling) for housing, plus farm buildings, polytunnels or processing.

Farm Vehicles

Pre 2030 - replace red diesel with clean fuels for non-road vehicles – zero emissions ICE power for cultivation / harvest operations.

Diesel Replacement

HGV's & large farm vehicles need low/zero carbon fuels, inc. farm produced (off-grid) biomethane or biofuels and in time - hydrogen.

Nutrient Recycling

Digestates and composts used to recycle carbon and nutrients from farm and other bio-residues back to land.

Energy Storage

On-site power storage for excess renewables / cheap electricity in batteries (inc. vehicle batteries - V2G), - also heat storage batteries.

SCAN ME

Rural Heating

Solar thermal - to supplement housing & farm (space/process) heat requirements, plus thermal storage.

Biomass Heat

Biomass energy (inc. straw / wood) for space heating/cooling or requirements like grain drying or primary processing.

Anaerobic Digestion

Farm residues, crops & local food waste to supply natural fertiliser and biogas or biomethane (upgraded on or off grid), for heat and vehicle fuel.

Hydrogen Supply

Potential for on-site hydrogen production from excess renewables (wind / solar) for vehicle or other rural uses.

Novel Systems

vertical and advanced protected cropping systems combined with zero carbon energy - also suited to urban farming.

On-farm renewable electricity and storage

On-farm generation – solar, wind, anaerobic digestion (+CHP)

On-farm storage – batteries; hydrogen

Green gas fuels CNG/H2

FARM OF THE FUTURE: JOURNEY TO NET ZERO

Low Emission Vehicles, Fuels and Powertrains

On-site Refuelling

'Electric and gas refuelling points to supply farm vehicles with low/zero carbon fuels generated and stored on-farm.

Diesel Replacement

Low emission gas fuels to replace 'red' diesel – including biomethane (from off and on-site biogas) and hydrogen from on-site electrolysis.

Robotic Vehicles

Small-scale task-dedicated autonomous vehicles, with AI and drones to monitor crop and soil health and enable precision treatments.

No-till Cropping

Replace cultivation with no-till solutions and lighter autonomous tractors to cut fuel use and reduce soil compaction.

Hydrogen on Farms

Green hydrogen from small-scale electrolysis of on-farm renewable electricity to fuel clean internal combustion (ICE) and fuel cell vehicles.

Biomethane Supply

Upgrading biogas from on-farm AD plants to biomethane for use as fuel for HGVs, and non-road vehicles and tractor.

Rural Public Vehicles

Replace fossil fuel in rural public transport / service vehicles – with green gas fuel and renewable electricity generated on local farms.

Medium Transport

Improved BEV designs with extended range and load capacity – also potential for hydrogen fuel cells.

Food Miles

Expand local production of 'premium' crops using vertical / hydroponic farming systems powered by locally generated renewable electricity / heat, in both rural and urban locations'.

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Low emission / autonomous farm vehicles

FarmTrac FT25G 15kW/20hp

JCB Hydrogen ICE prototype loader

CNH T6 180 Methane Tractor

Low emission / autonomous farm vehicles

FarmTrac FT25G 15kW/20hp

JCB Hydrogen ICE prototype loader

CNH T6 180 Methane Tractor

Tom and Dick – Small Robot Company

Farm drone with 5G - Wessex Internet

Agrobot strawberry gantry

‘Farm of the Future’ – Key policy proposals

Action required across DEFRA, BEIS, DfT and Treasury to:

- **Fix** rural fossil fuel replacement timetable (inc. red diesel subsidy) while supporting biomethane (on & off-grid) and other gas fuels options.
- **Confirm** the transition of subsidy support to the Environmental Land Management Scheme (ELMS).
- **Encourage** R&D support for digital / AI controlled machines – increasing precision applications, reducing soil compaction and labour.
- **Facilitate** rural connectivity and communications to access and embrace digital technologies, autonomy, field robotics & AI within supply chains.
- **Enable** farmer access to research, knowledge transfer, demo sites, field trials and independent advice – a network of low carbon exemplar sites.

FARM OF THE FUTURE:

Journey to Net Zero

Thank you for listening

SCAN ME

- On-farm low and zero carbon energy
- Managing soils, sequestering carbon, supporting biodiversity
- Land resource management
- Low emission vehicles, fuels and powertrains
- Agri-food supply chain decarbonisation
- Need for farm innovation demonstrators, R&D, support and advice

STEVE MARTIN

DERBYSHIRE DALES COMMUNITY ENERGY

Stephen Martin
Chair of Derbyshire Dales Community Energy

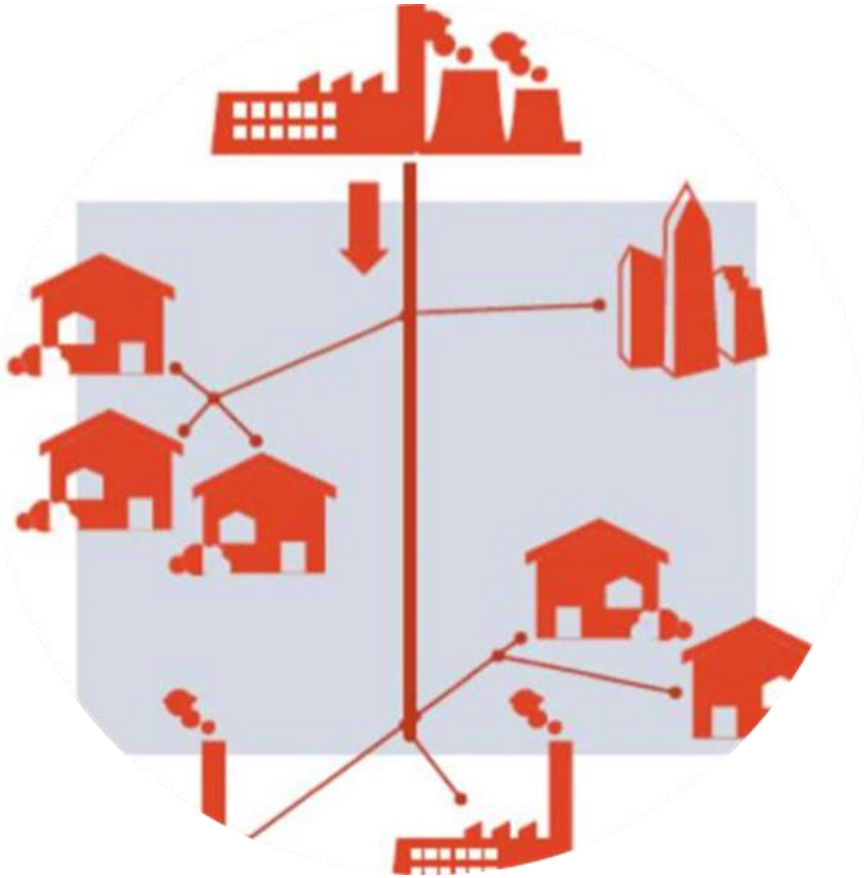
12 October 2022

Community Energy in Matlock and The Derbyshire Dales

Agenda

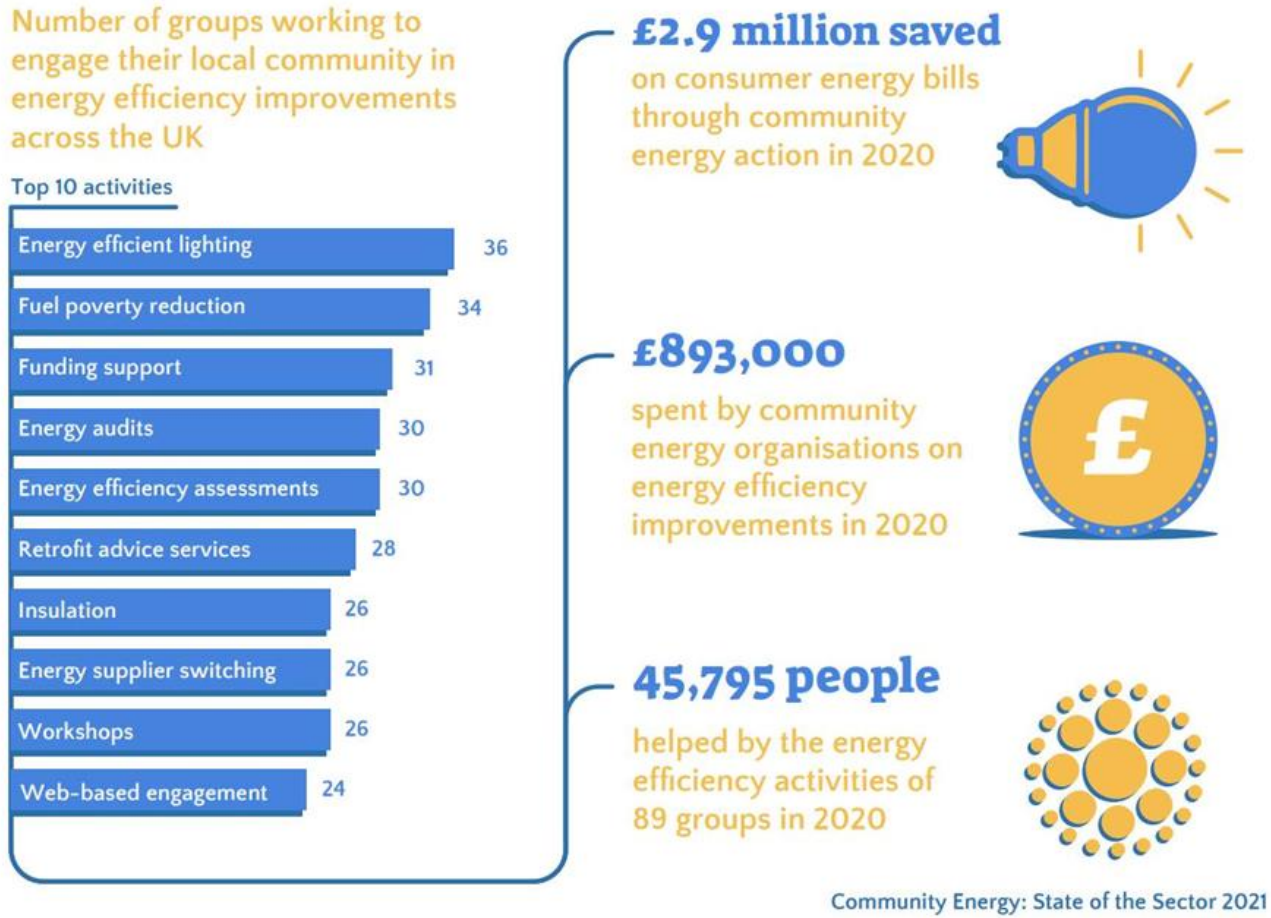
1. What is Community Energy?
2. Feasibility – RCEF Stage 1 funding
3. Development – RCEF Stage 2 funding
4. Wider Adoption and Capacity Building in Derbyshire

Our energy system - the need for change



Supporting net zero
Affordability
Democratisation

Motivating factors and Achievements



Rural Community Energy Fund

- £10 million DEFRA programme supporting rural communities in England to develop renewable energy projects that provide economic and social benefits to the community
- Stage 1: grants of up to £40,000 for a feasibility study for a renewable energy project
- Stage 2: grants of up to £100,000 for business development and planning of feasible schemes
- Support provided to formally constituted entities through the Midlands Net Zero Energy Hub managed by Nottingham City Council

Derbyshire Dales RCEF Feasibility Study

- Identify two potential sites within the area that are suitable for electricity generation.
- Identify suitable customers / offtakers for the electricity from such sites who would be willing to enter into a long term PPA.
- Evaluate of the planning implications for such sites.
- Define the most suitable structure for a community energy group (CEG)
- Assess the local community's appetite for engagement / involvement in any scheme.

Chosen sites

- Based on onsite consumption, site engagement, roof structure.
- Other factors to consider include what capacity there is available in the local grid.

Finalised sites

Generation statistics	Twigg Stores	Highfields Upper
System size (kW)	70	150
Carbon saved (tCO_2e/yr)	14	32
Annual electricity generation (MWh)	59.64	137.35
Proportion of total electricity provided (%)	80	36
Proportion of total roof area (%)	83	40
Initial Incremental Cost (£)	87,500	187,500
Annual O&M cost (£)	427	915

Project outcomes

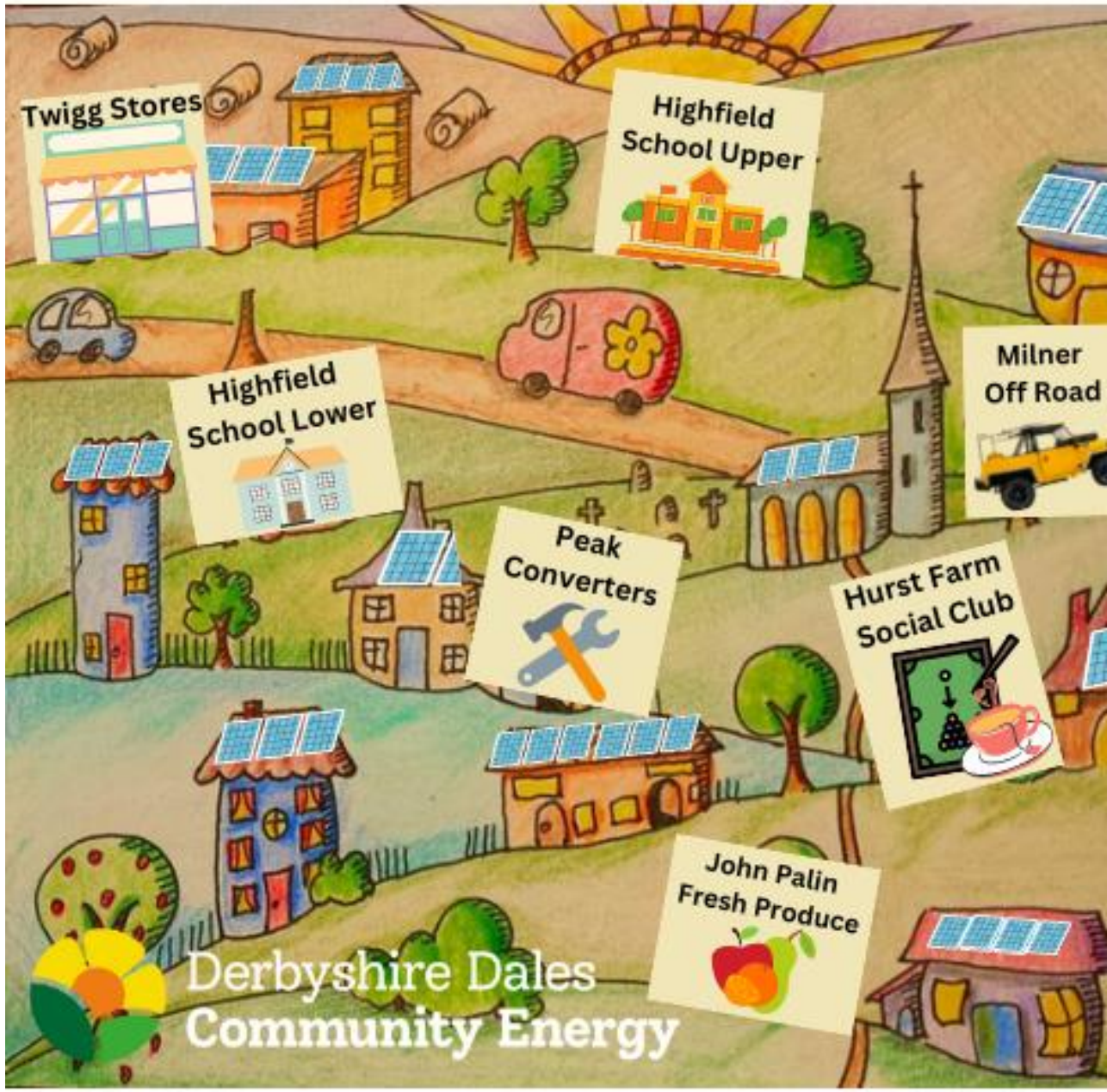
- Establishment of a community benefit society
- Apprentice seconded from Octopus Energy
- Raised awareness of community energy in Matlock
- RCEF Stage 1 report showing two viable sites in the town
- Potential pipeline of sites in Matlock and beyond

Potential areas for community benefit

- Key feature of community energy programmes is the creation of positive social outcomes.
- Fuel poverty alleviation programmes e.g. Marches Energy Agency
- Local carbon reduction / environmental programmes e.g. Derbyshire Wildlife Trust, supporting local green spaces

RCEF Stage 2

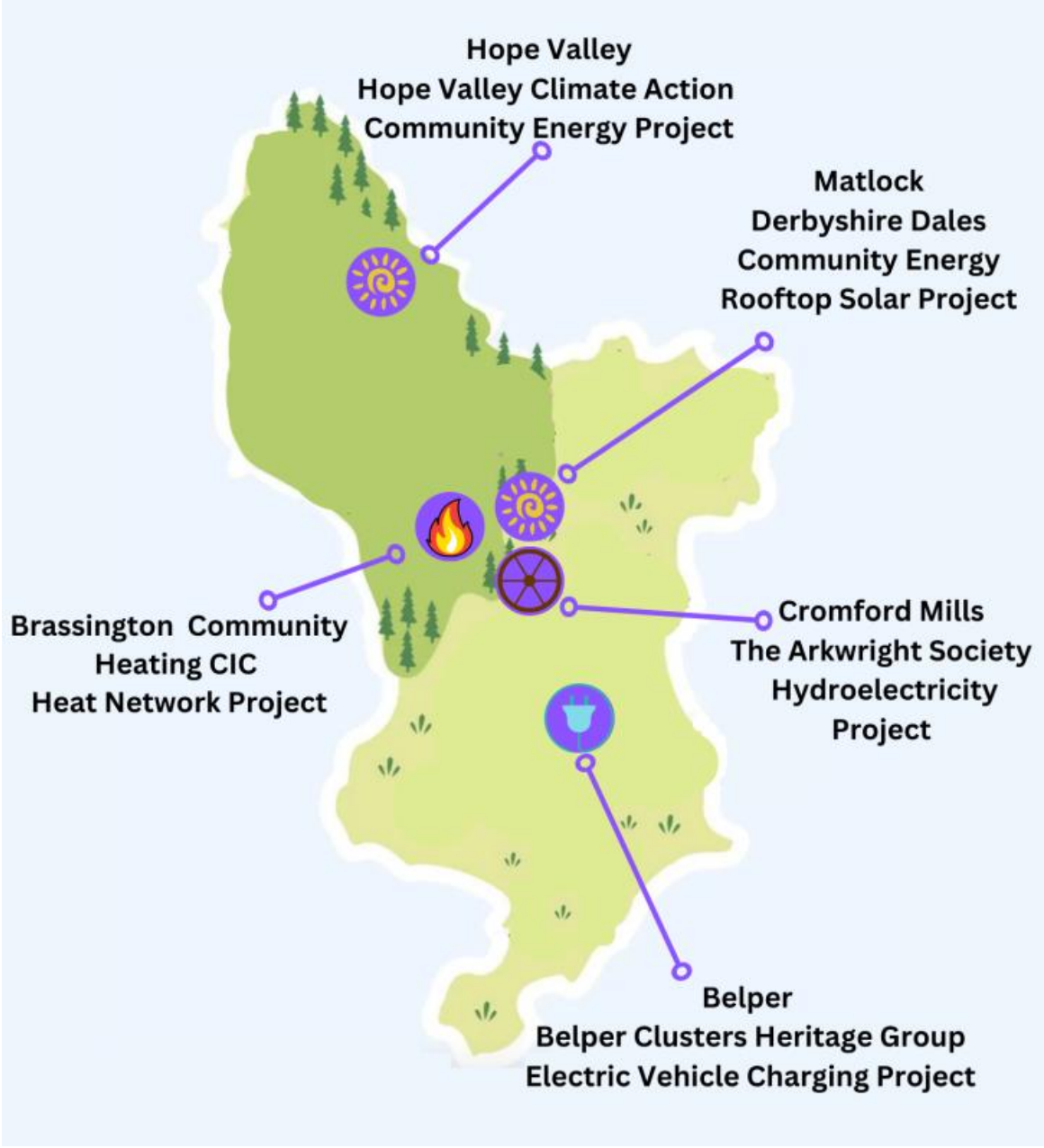
creating a bigger portfolio of sites



Portfolio Totals

- 963kWp total installed capacity
- Producing 826MWh per year – enough for almost 300 houses
- Saving 450 tonnes of CO_2 per year
- Cost savings estimated at £1m over 20 years

Celebrating Community Energy across Derbyshire

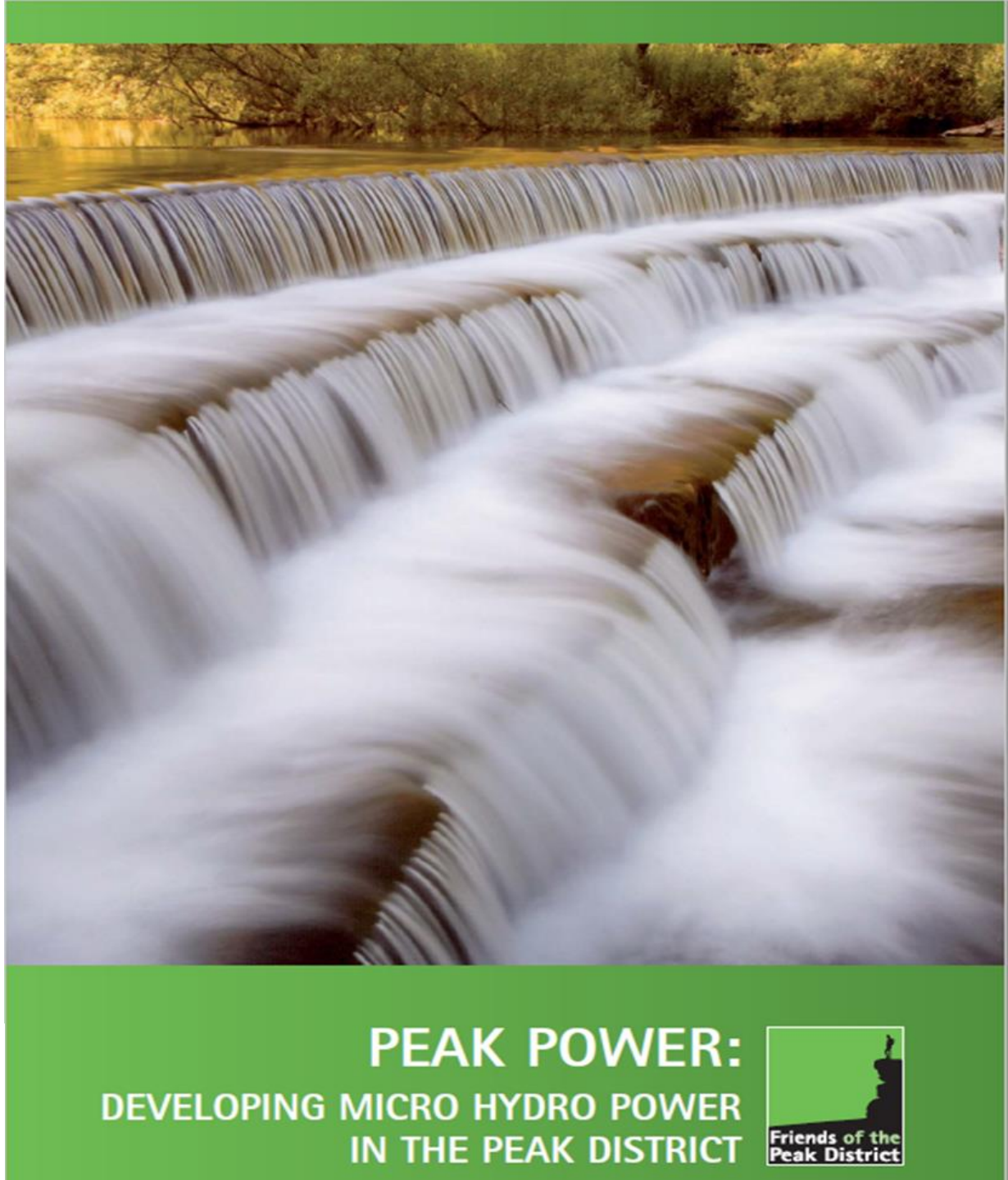


Building capacity for Community Energy across Derbyshire

- General information and advice/training
- Technical information and resources
- Informal planning advice & support
- Local Solar PV installers
- Establishing a Benefit Society
- Bidding for additional funding
- Community engagement on decarbonisation
- Collaboration on site selection and assessment:
  - Roof surveys
  - Digital renewable energy generation mapping
  - Financial community benefits.

Derbyshire Dales
Community Energy

www.derbyshiredalesenergy.org.uk



SESSION 1: POWER, HEAT, TRANSPORT

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