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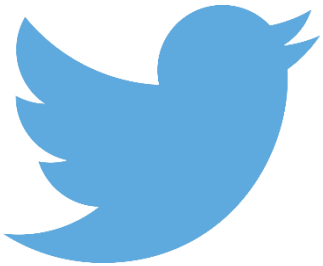

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Becoming Net Zero Carbon Across The Corporate Building Estate

By Alan Barber

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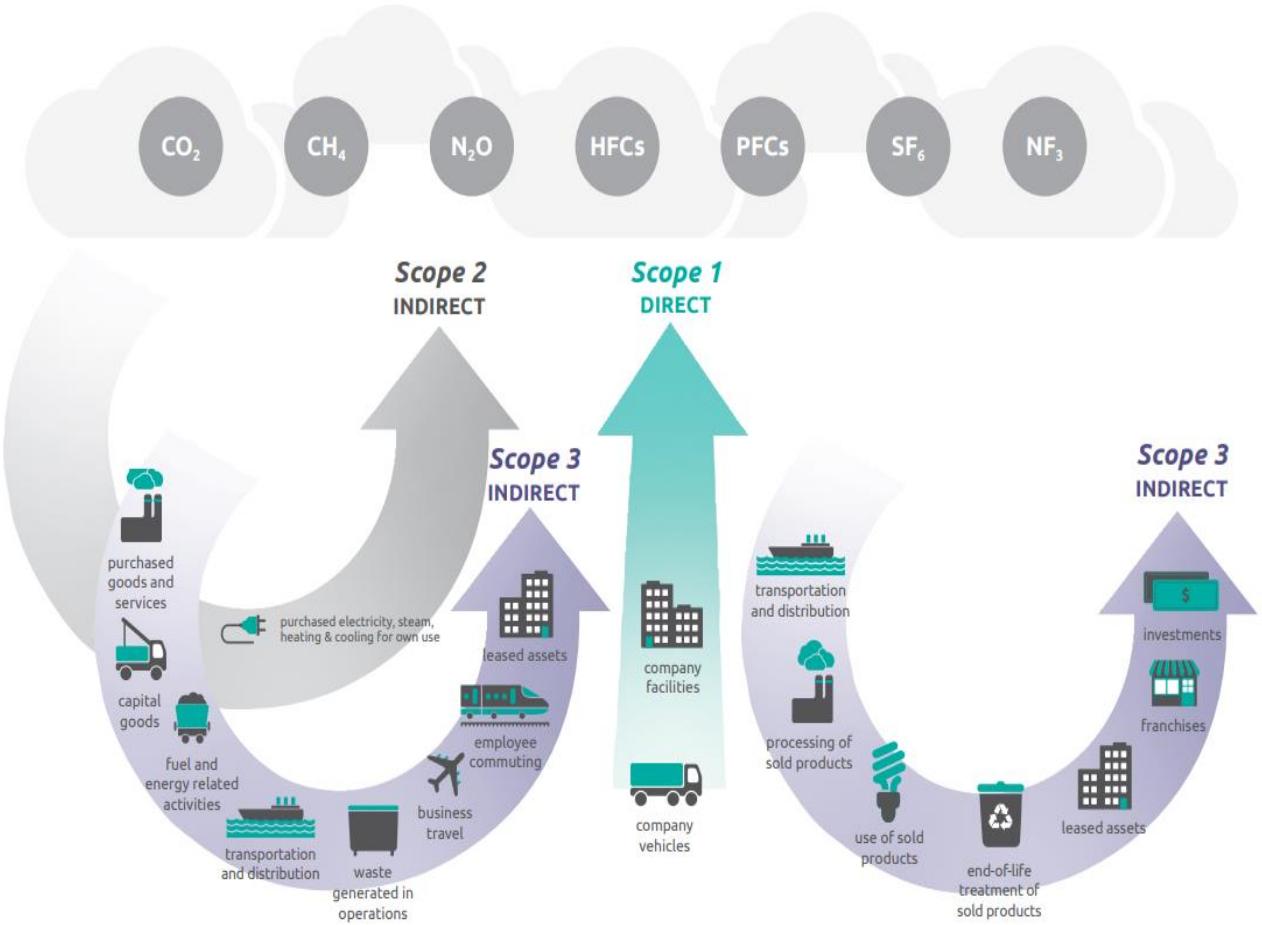
Emissions



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Global Warming Potential

Greenhouse Gas	Global Warming Potential (GWP)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide(N_2O)	298
Hydrofluorocarbons (HFCs)	124 – 14,800
Perfluorocarbons (PFCs)	7,390 – 12,200
Sulfur hexafluoride (SF_6)	22,800
Nitrogen trifluoride (NF_3)[3]	17,200

Carbon conversion factors

Fuel kWh	kg CO_2e*
Fuel Oil	0.26782
Grid supplied electricity	0.2556
LPG	0.21447
Natural Gas	0.18385
Biomass wood pellets	0.01563

How to get your estate to be zero carbon

- Reduce energy usage and optimise building performance (i.e. energy efficiency)
- Generate renewable local power
- Offset

Challenges

- Corporate challenges
- Zero carbon heating
- Grid capacity

Identifying your current carbon footprint and baseline

- Usage (kWh)
- Carbon conversion factor
- Cost
- Floor area

Benchmark buildings

Site	Annual Electricity Usage (kWh)	Floor Area (m^2)	kWh/m^2
Office A	500,000	4,000	125
Office B	600,000	5,000	120
Office C	700,000	10,000	70

- kWh/m^2
- Display Energy Certificate (DEC)
- Energy Performance Certificate (EPC)
- CIBSE Benchmarking Tool
- Condition surveys

Carbon Strategy

		Estimated savings in Year 1			Accumulative saving over 10 years including energy and maintenance (£ in 10 yrs)	Estimated cost and payback periods	
Item	Description of project	Total cost saving (£ in Year 1)	Energy savings (kWh/yr)	CO_2 savings (tonnes/yr)		Potential capital cost of project (£)	Simple payback (years)
1	BMS strategy upgrade	£6,000	230,000	42	£80,000	£18,000	3.0
2	Gas driven Combined Heat and Power (CHP)	£95,000	N/A	250	£1,250,000	£360,000	3.8
3	Install LED lighting	£19,000	100,000	26	£250,000	£65,000	3.4
4	25kWp solar PV	£3,700	23,000	6	£50,000	£25,000	6.0
Total		123,700	353,000	324	£1,630,000	£468,000	3.8

- Collect data
- Site survey
- Reporting

Prioritising projects and feasibility studies

- Analysing existing and proposed building loads
- Comparing technologies
- Maintenance requirements and cost
- Carbon savings
- Cost savings
- Funding opportunities
- Payback and ROI

Prioritising projects and feasibility studies

Existing			Proposed			Savings			Payback	
Existing luminaire	Annual Running Cost	Carbon (tonne)	Proposed Luminaire	Annual Running Cost	Carbon (tonne)	% saving	Annual cost saving	Carbon saving (tonne)	Payback via energy savings	Payback via energy savings and maintenance
Recessed downlight with 40W ES lamp	£2,315	4.1	LED Equivalent	£347	0.6	85	£1,968	3.5	4.2	3.6
50W halogen spot	£2,894	5.2	LED Equivalent	£579	1.0	80	£2,315	4.1	2.7	2.4
150mm diameter recessed single CFL	£1,730	3.1	LED Equivalent	£347	0.6	80	£1,383	2.5	6.0	4.8
1463mm (5ft) T5 single 35W batten	£2,330	4.1	LED Equivalent	£1,389	2.5	40	£940	1.7	10.4	7.7
1500mm (5ft) T8 single 58W batten	£3,860	6.9	LED Equivalent	£1,389	2.5	64	£2,471	4.4	3.9	3.5
1500mm (5ft) T12 single 65W batten	£4,326	7.7	LED Equivalent	£1,389	2.5	68	£2,937	5.2	3.3	3.0
2D 38W surface mounted bulkhead	£2,529	4.5	LED Equivalent	£752	1.3	70	£1,777	3.2	4.8	4.0
600x600 T5 4 tubes recessed	£1,864	3.3	LED Equivalent	£926	1.6	50	£938	1.7	11.9	8.8
600x600 T8 4 tubes recessed	£4,792	8.5	LED Equivalent	£1,563	2.8	67	£3,229	5.7	3.5	3.1

Based on 100no. Luminaires on for 14hours/day, 5 days/week

Building Management System (BMS) Audit

The audit includes:

- Site visit to survey the BMS and building services installations
- Download of the existing BMS control strategy
- Checks of plant operation
- Remote evaluation of the control strategy, including a review of:
  - Occupancy schedule
  - Control setpoints, parameters and loops
  - Controller firmware and system control users
  - Systems alarms
  - Safety circuits and building protection strategies

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