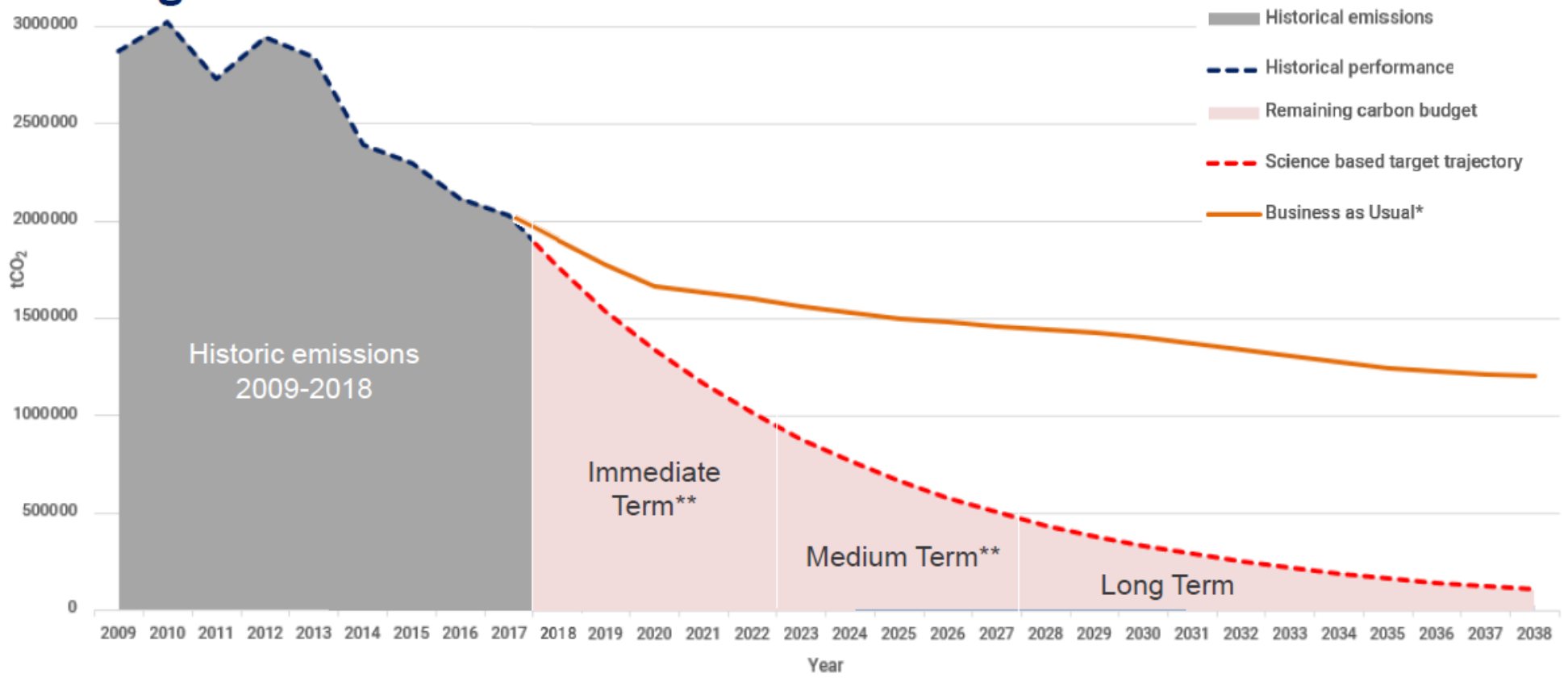
ZERO CARBON OXFORD
AMBITION AND REALITY

1. Carbon emissions pathway consistent with 2°C Paris Agreement



Total budget (2018-2100) tCO_2	Immediate term (2018-2022) tCO_2	Medium term (2023-2027) tCO_2	Long term (2028-2037) tCO_2
15,187,610	6,928,620	3,593,560	3,046,920

* Business as usual as defined by Level 1ambition thresholds within the Anthesis' SCATTER model.
** Immediate Term & Medium Term periods align with the 3rd and 4th nationally legislated carbon budget periods (respectively) under the UK Climate Change Act (2008).

The UK Government has passed legislation to reach ‘net zero’ carbon by 2050.

Q. Should Oxford be more proactive and seek to achieve ’net zero’ sooner than 2050 and what trade-offs are we prepared to make?

OXFORD'S VIEW

90% of Assembly Members said

YES, but

Domain	Zero Carbon Grid post SCATTER			
	Level 1	**Level 2**	**Level 3**	**Level 4**
Renewable Energy General	170% increase in installed solar PV by 2025.	240% increase in installed solar PV by 2025.	300% increase in installed solar PV by 2025.	460% increase in installed solar PV by 2025.
Passenger Transport Shift	By 2050: •100% zero emission cars and buses •100% busses and passenger trains electrified.	By 2040: •100% zero emissions cars& buses By 2050: •Complete railway electrification	By 2035: •100% zero emissions cars and buses By 2050: •Complete railway electrification	By 2035: •100% zero emissions cars and buses By 2025: •Complete railway electrification
Commercial Property Appliances	Energy demand for lights & appliances increases by 33% with electricity providing 60% of demand	Energy demand for lights & appliances increases by 15% with 100% electric use	Energy demand for lights & appliances decreases by 5% with 100% electric use	Energy demand for lights & appliances decreases by 30% with 100% electric use
Freight Shift to Low Emissions	•Road haulage makes up 73% of distance, using conventional engines •Rail all diesel	Some shift from road to rail and water •More efficient engines	Greater modal shift to rail and water •More efficient HGVs •More efficient logistics	Road modal share falls to 50%; greater hybridisation •Rail freight is all electric
Electrification of Heating	The proportion of domestic heat supplied using electricity is 0-10%, as today	The proportion of domestic heating systems using electricity is 20%	The proportion of domestic heating systems supplied using electricity is 30-60%	The proportion of domestic heating systems supplied using electricity is 80-100%
Energy Storage and Demand	•150 MW storage •170 MW interconnection & some demand shifting	•170MW storage •422MW interconnection & substantial demand shifting	300MW storage •634MW interconnection & substantial demand shifting	•845MW storage •1.27GW interconnection
Domestic Property	17% of homes insulated, average thermal leakiness reduces 20%	Over 20% of homes insulated, average thermal leakiness reduces 39%	45% of homes insulated, average thermal leakiness reduces 57%	60% of homes insulated, average thermal leakiness reduces 75%
Increase in Recycling	65% recycling, 10% landfill,25% incineration by 2040, remaining constant to 2050	65% recycling, 10% landfill,25% incineration by 2035, remaining constant to 2050	65% recycling, 10% landfill,25% incineration by 2040, increasing to 75% by 2050	65% recycling, 10% landfill,25% incineration by 2035, increasing to 85% by 2050

MESSAGES FOR COUNCIL

Council should :

- Make most of convening powers to form coalition of willing
- Lead on engagement with institutions, communities and individuals
- Build a much wider appreciation of and support for the notion of being a exemplar city and council
- Biodiversity, nature, quality of life as important as technical measures
- Build evidence base for action at national level

OUR RESPONSE?

- Action
- Partnership
- Influence

Science/data led targets and actions

HEADLINE COMMITMENTS

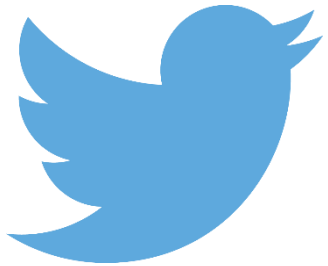
- Significant step up in engagement
- Net zero carbon Council for Council operations during 2020
- Outline plan for assets in time for budget
- Zero Carbon Oxford summit and partnership
- Significant step up in commitment around Natural Resource Management
- Call for bring forward of end of ICE vehicle sales
- Campaign for clarity ambitious zero carbon homes standards

SCIENCE AND DATA LED

- Set and report against 5 year carbon budgets for city
- Secure scientific advise to council
- Only set targets where we have consensus that that they are achievable


OXFORD CITIZENS ASSEMBLY
ON CLIMATE CHANGE

Be part of the conversation!
Follow APSE on Twitter and LinkedIn



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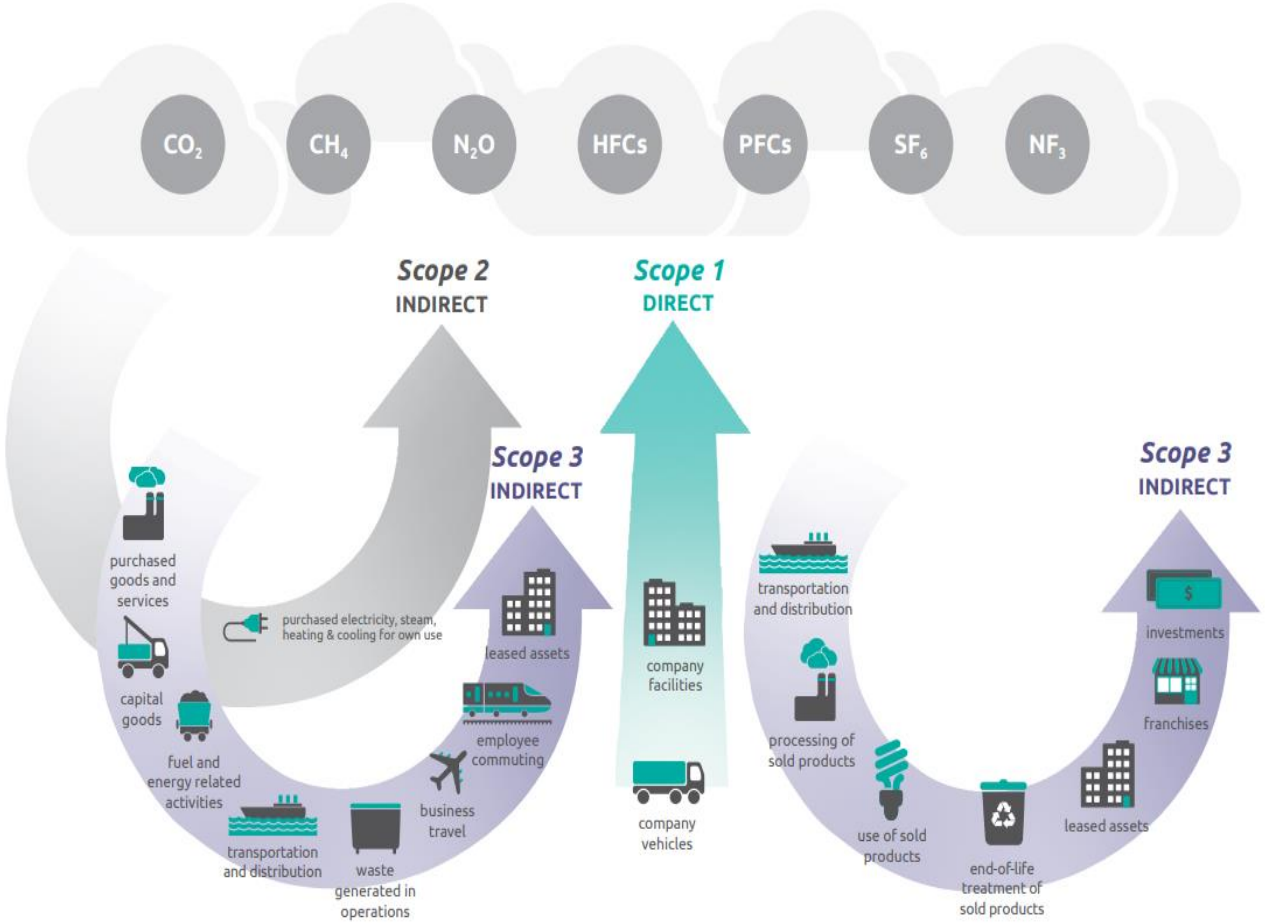
Making Your Assets Greener and the Road to Net Zero Carbon

By Alan Barber

APSE Energy Associate and Director of Salvis

Emissions


CO_2
CH_4
N_2O
HFCs
PFCs
SF_6
NF_3
Scope 2
INDIRECT
Scope 1
DIRECT
Scope 3
INDIRECT
Scope 3
INDIRECT
purchased goods and services
capital goods
fuel and energy related activities
transportation and distribution
waste generated in operations
business travel
employee commuting
leased assets
purchased electricity, steam, heating & cooling for own use
company facilities
company vehicles
transportation and distribution
processing of sold products
use of sold products
end-of-life treatment of sold products
leased assets
franchises
investments

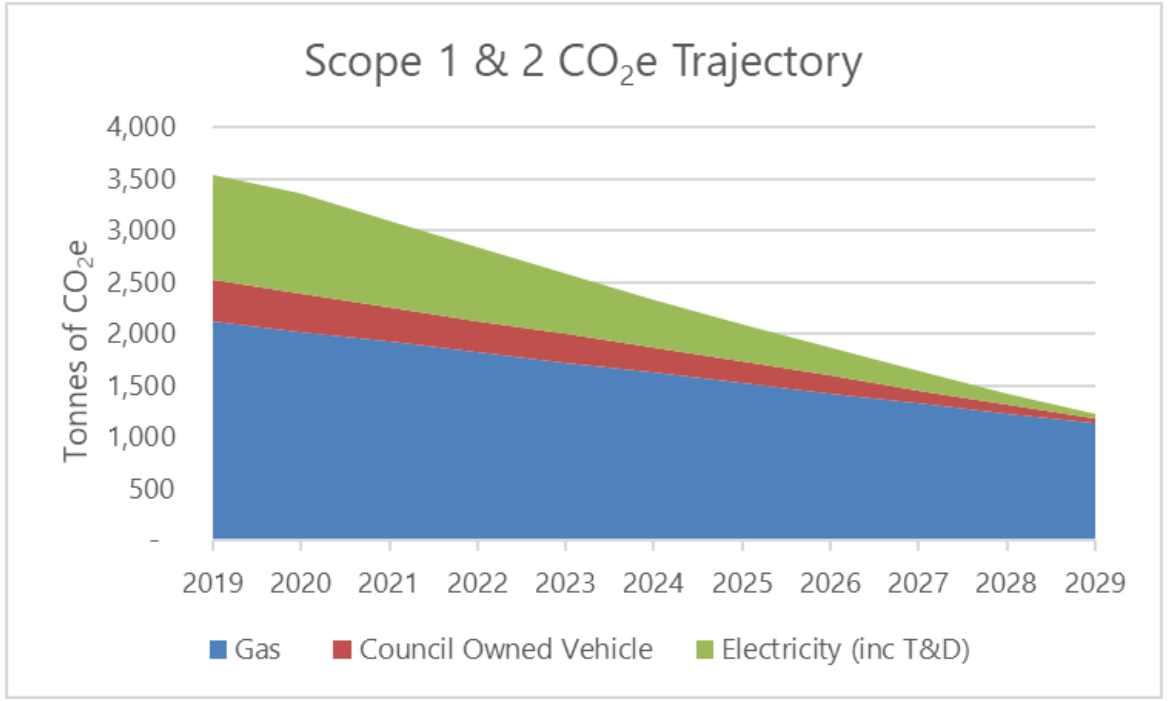
2019 Carbon Conversion Factors

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 net zero carbon

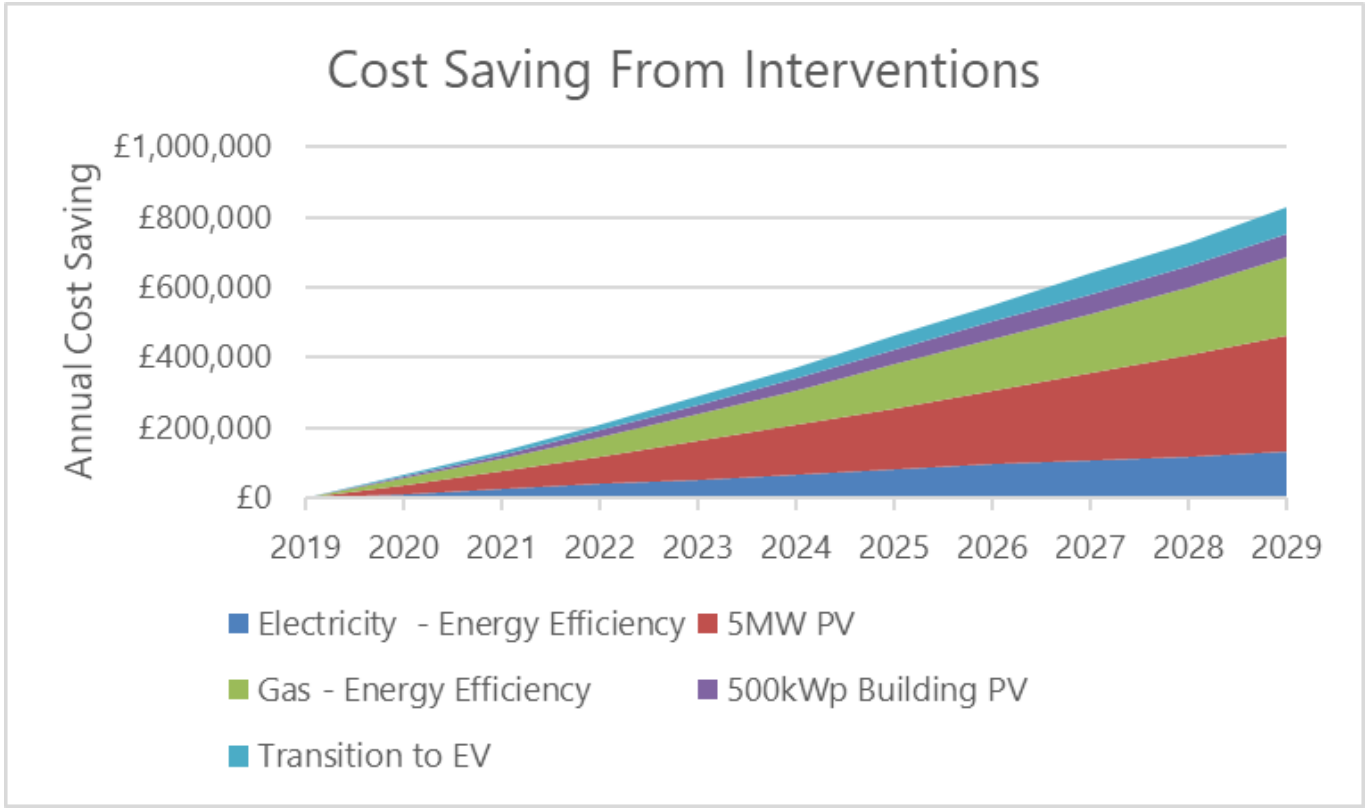
- Reduce energy usage and optimise building performance (i.e. energy efficiency)
- Generate renewable local power
- Offset

Carbon Emissions Trajectory 2019 to 2030



If all gas heating systems were replaced with heat pumps with a COP of 4, the carbon emissions in 2030 would be change from **1,043 tCO_2e for gas plant to 180 tCO_2e for electric heat pumps**.

Cost savings from interventions between 2019 to 2030



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

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:

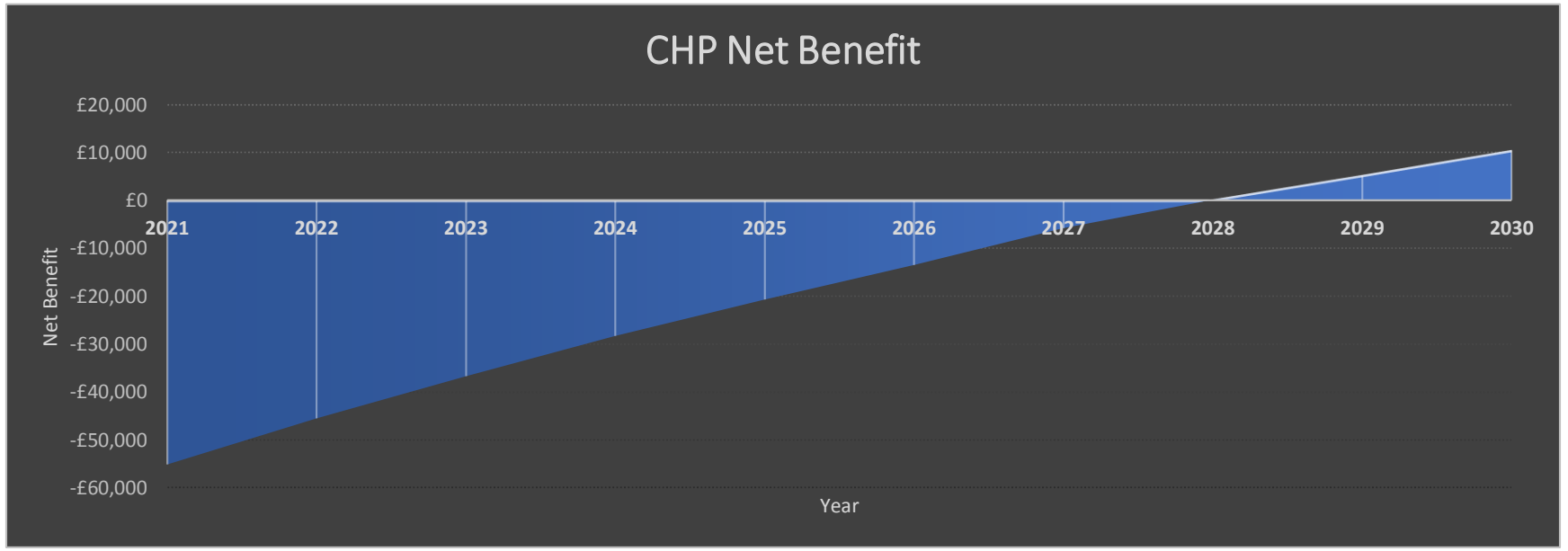
- Site visit to survey the BMS and building services installations
- Download of the existing BMS control strategy
- Checks of plant operation
- Remote evaluation of the control strategy, including a review of:
  - Occupancy schedule
  - Control setpoints, parameters and loops
  - Controller firmware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

Leisure Centre

		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
- Design
- Project management

Review of Leisure Centre CHP Performance



Recommendations

- **BMS audit and optimise control strategy**
- **Install a thermal store**
- **Calibrate meters and monitor performance**

COVID-19 and Carbon Strategies

- Has not impacted the drive for zero carbon
- How we use buildings will change
- Start your action plan now
- Importance of building control

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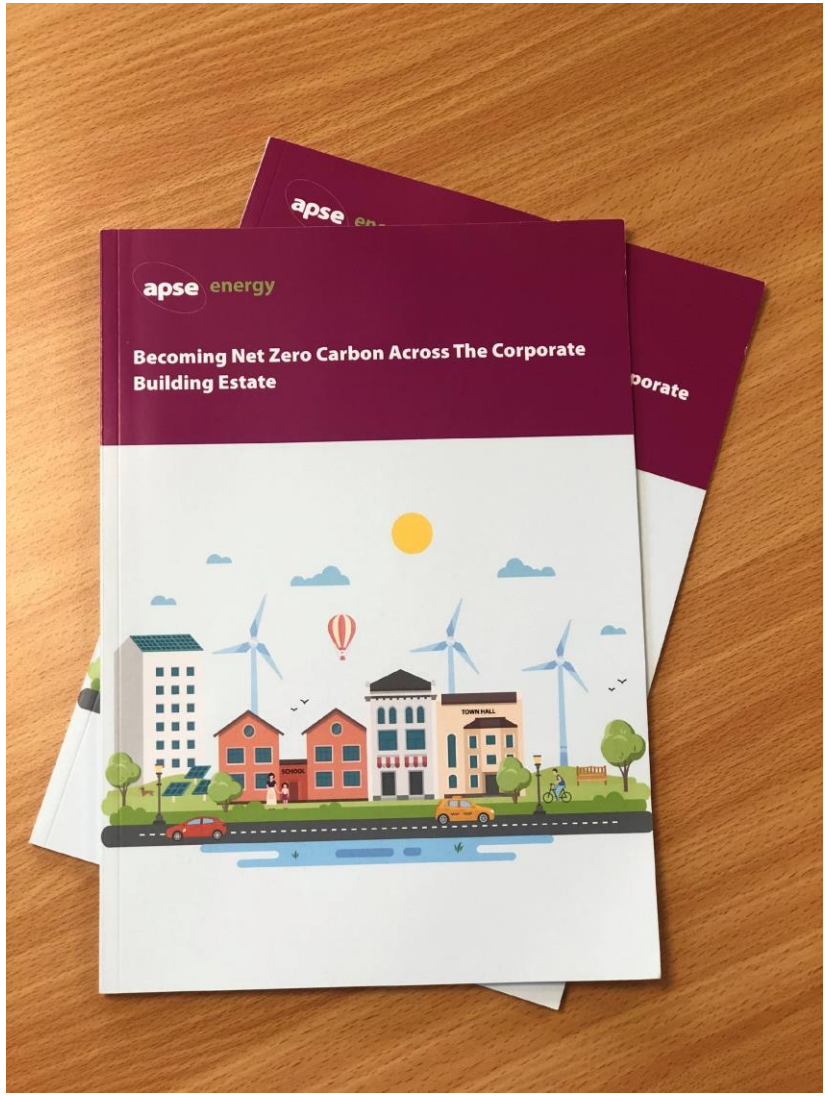

www.apse.org.uk

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