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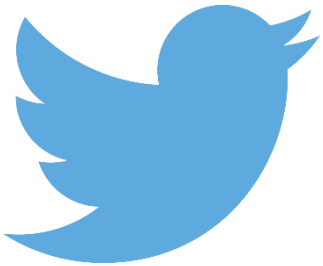

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Net Zero and Leisure Energy Audits

By Alan Barber

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& Director of Salvis

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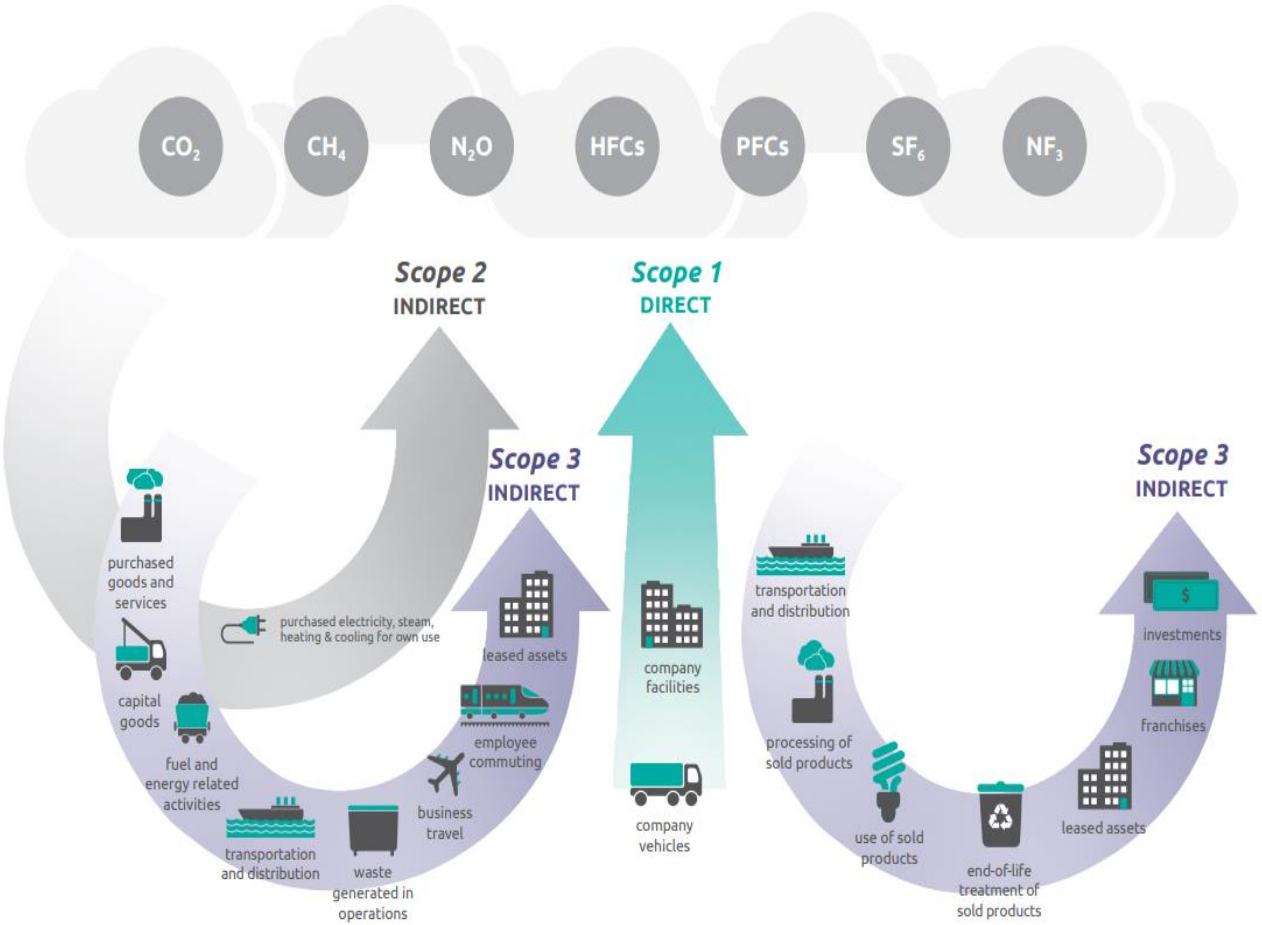
Emissions


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

Leisure Centre Energy

- Scope 3 emissions
- Often the most expensive and carbon intensive buildings in estate
- Design is critical to ensure correct environmental conditions are achieved

How to get your building estate to be zero carbon

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

Case Study – Spectrum Leisure Centre, Guildford

- Guildford Spectrum is a 5 storey Leisure Centre and Sports Complex that houses swimming pools, ice rink, sports halls, gym, bowling hall, restaurants & cafes, and various changing rooms and facilities.
- Built in 1993
- 3600kW boilers and 486kW CHP
- 4-pipe ASHP/chiller that provides simultaneous heating and cooling

Condition Based Energy Audit

Replace equipment based on age and condition

Combined Heat and Power

- Historically a low carbon technology and cost effective
- Unlikely to be a low carbon solution nor cost effective in the future

Low Carbon Heating

- Heat Pumps
- Considerations for a low temperature system
- A 4-pipe multifunctional chiller is a heat pump that simultaneously provides heating and cooling. This works by using the heat absorbed from the cooling system to be utilised within the heating system, rather than being rejected to atmosphere. The difference between the heating and cooling output is made up by absorbing/rejecting heat from the atmosphere. This leads to much higher COPs (4-8) compared to traditional chillers (2-4)

Electrical Capacity

- Critical to consider at an early stage
- Can be very expensive to upgrade the network

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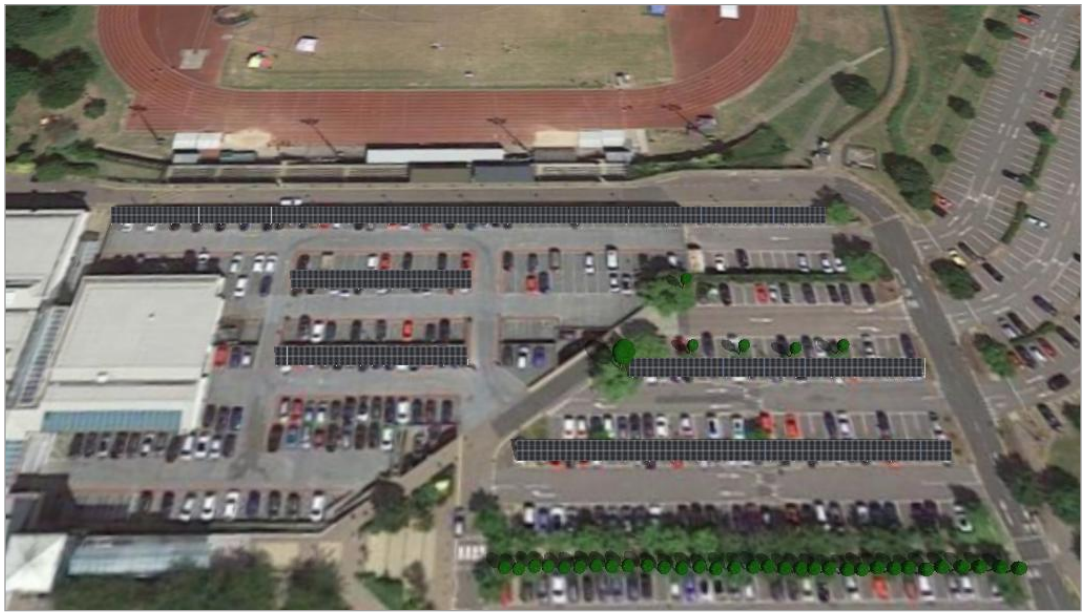
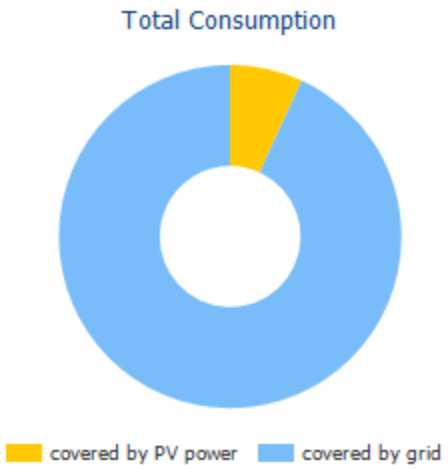
Solar Photovoltaic and Solar Thermal

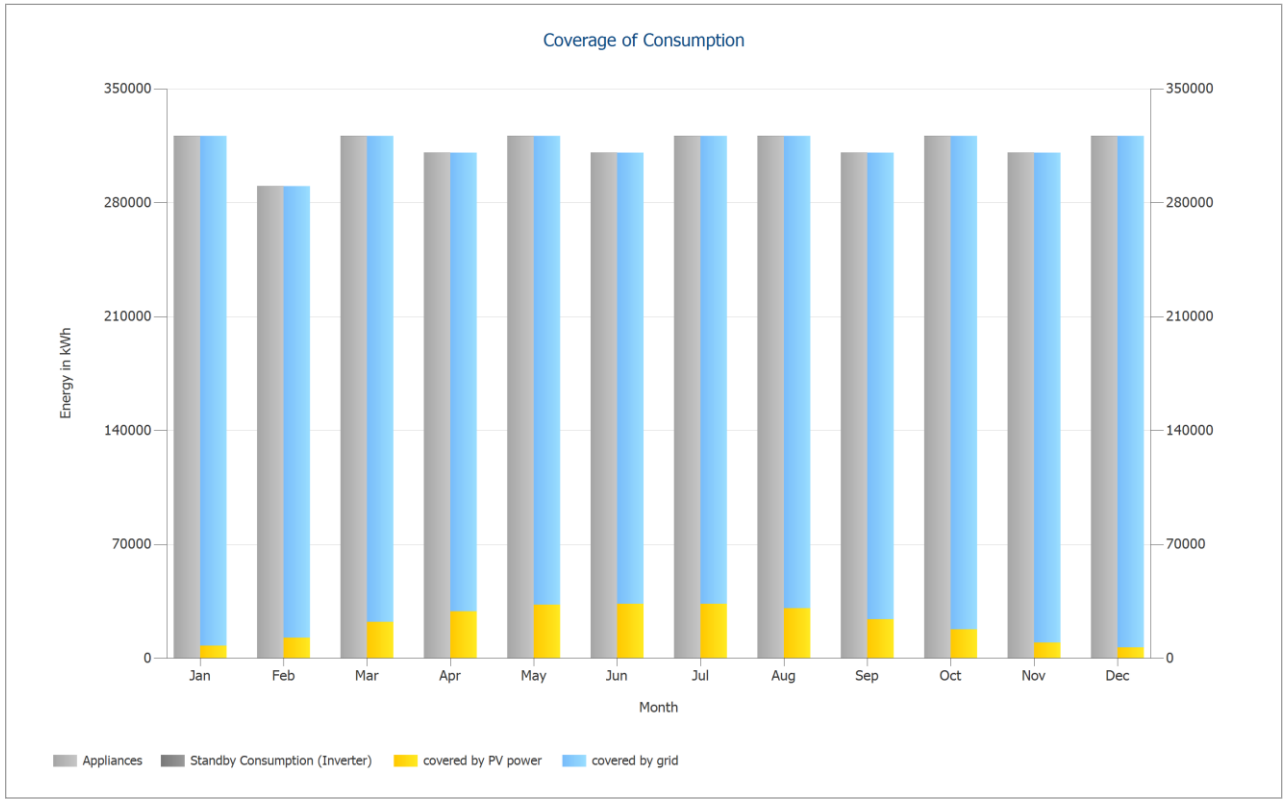


246kWp Solar Canopy

Spec. Annual Yield	1,053.40	kWh/kWp
Performance Ratio (PR)	91.06	%
Yield Reduction due to Shading	1.6	%/Year
PV Generator Energy (AC grid)	259,434	kWh/Year
Own Consumption	259,434	kWh/Year
Down-regulation at Feed-in Point	0	kWh/Year
Grid Feed-in	0	kWh/Year
Own Power Consumption	100.0	%
CO_2 Emissions avoided	121,913	kg / year

Solar Photovoltaic Energy Generation





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Building Fabric

- Reducing heat loads can reduce capital cost of replacement heating system
- No thermal modelling carried out
- Can be very expensive

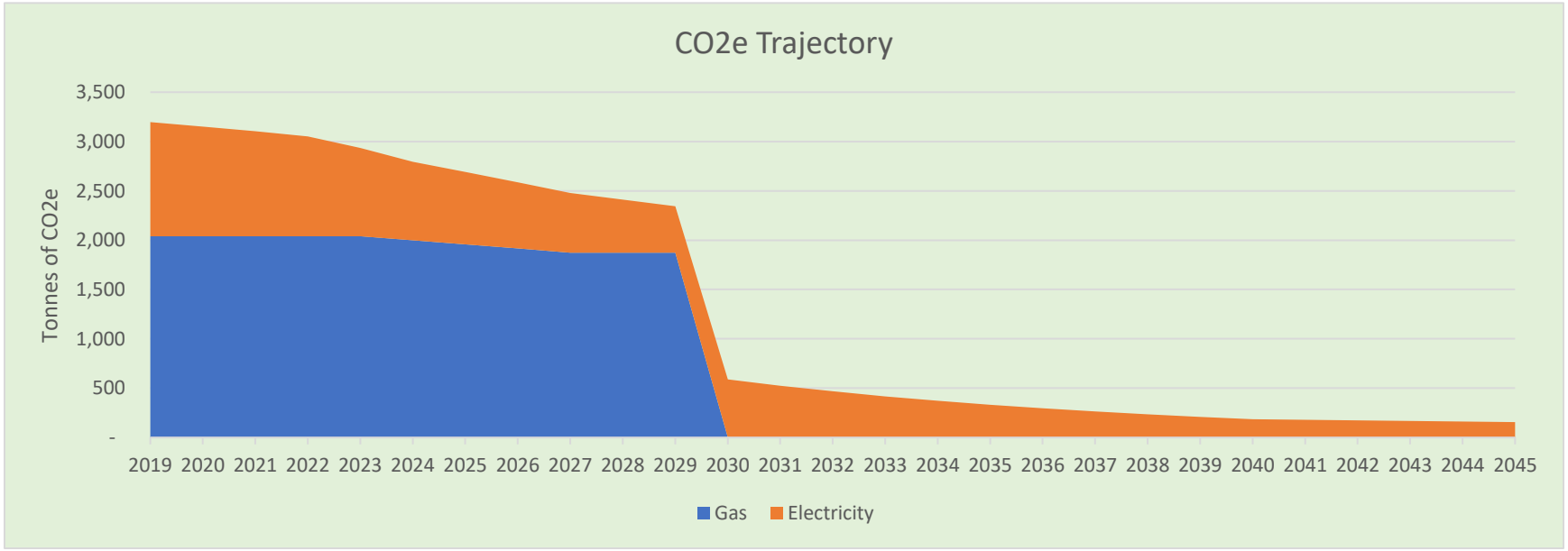
Delivery Programme

- CHP to only run when there is sufficient thermal demand – 2024
- Pool Shell & Tube Heat Exchangers Replacement – 2024
- Solar PV canopy - 2024
- AHU and Extract Fan Replacement Works – 2024 – 2027
- LED installations – 2024
- LPHW main distribution and other heat emitters replacement – 2028
- Installation of 6 no new 4-pipe Multifunctional Chillers/ASHP – 2029
- Turn off CHP unit – 2029
- Replacing gas burning cooking appliances – Whenever kitchens are refurbished prior to 2030

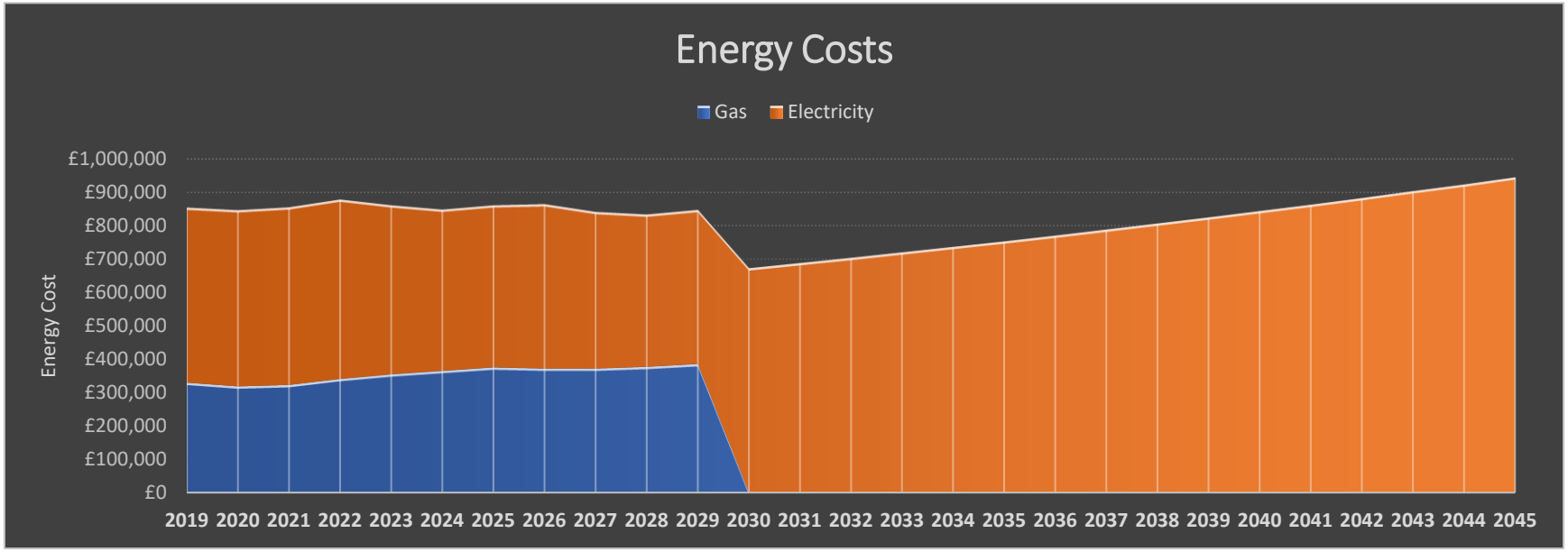
Costs

Main Large AHU	Other AHU	4-Pipe Multifunctional Chillers	Glycol ChW System to Ice Rink AHU	General ChW System	Low Temperature LPHW System	High Temperature LPHW System & DHW	Heat Emitters	LED Lighting	Solar PV	Equipment	Other	Total
£947,000	£410,000	£1,174,000	£33,000	£193,000	£580,000	£242,000	£450,000	£27,900	£223,000	£158,700	£83,200	£4,521,800

Carbon Trajectory



Energy Costs



Hard to Reduce Emissions and Offsetting of Carbon

590 tCO_2e of unavoidable emissions by 2030 that would need to offset the electricity consumption in order to be net zero carbon

Public Sector Decarbonisation Scheme

(PSDS Phase 4)

- Technical application
- Pre and post peak heat loss and system sizing
- Like for like costs
- Age of plant
- Detailed cost breakdown
- Electrical capacity
- £510 tCO_2LT
- Minimum 12% contribution

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

Carrying Out Energy Audits

- Prepare a report that can be submitted with the PSDS application
- Include energy saving calculations
- Include a breakdown of capital cost

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