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Construction Sector - Sustainabilty & Innovation

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Head of Building Performance
Willmott Dixon Group

Net Zero
The UK's contribution to stopping global warming

Committee on Climate Change
May 2019

UK net-zero GHG scenario

	2020s	2030s	2040s
ELECTRICITY	Largely decarbonise electricity: renewables, flexibility, coal phase-out	Expand electricity system, decarbonise mid-merit/peak generation (e.g using hydrogen), deploy bioenergy with CCS	
HYDROGEN	Start large-scale hydrogen production with CCS	Widespread deployment in industry, use in back-up electricity generation, heavier vehicles (e.g. HGVs, trains) and potentially heating on the coldest days	
BUILDINGS	Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)	Widespread electrification, expand heat networks, gas grids potentially switch to hydrogen	
ROAD TRANSPORT	Ramp up EV market, decisions on HGVs	Turn over fleets to zero-emission vehicles: cars & vans before HGVs	
INDUSTRY	Initial CCS clusters, energy & resource efficiency	Further CCS, widespread use of hydrogen, some electrification	
LAND USE	Afforestation, peatland restoration		
AGRICULTURE	Healthier diets, reduced food waste, tree growing and low-carbon farming practices		
AVIATION	Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels		
SHIPPING	Operational measures, new ship fuel efficiency, use of ammonia		
WASTE	Reduce waste, increase recycling rates, landfill ban for biodegradable waste	Limit emissions from combustion of non-bio wastes (e.g Deploy measures to reduce emissions from waste water)	
F-GASES	Move almost completely away from F-gases		
GREENHOUSE GAS REMOVALS	Develop options & policy framework	Deployment of BECCS in various forms, demonstrate direct air capture of CO_2, other removals depending on progress	
INFRASTRUCTURE	Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids	Hydrogen supply for industry & potentially buildings, roll-out of infrastructure for hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion	
CO-BENEFITS	Health benefits due to improved air quality, healthier diets and more walking & cycling Clean growth and industrial opportunities		

Notes:
CCS = carbon capture and storage.
EV = electric vehicle.
BECCS = bioenergy with CCS.

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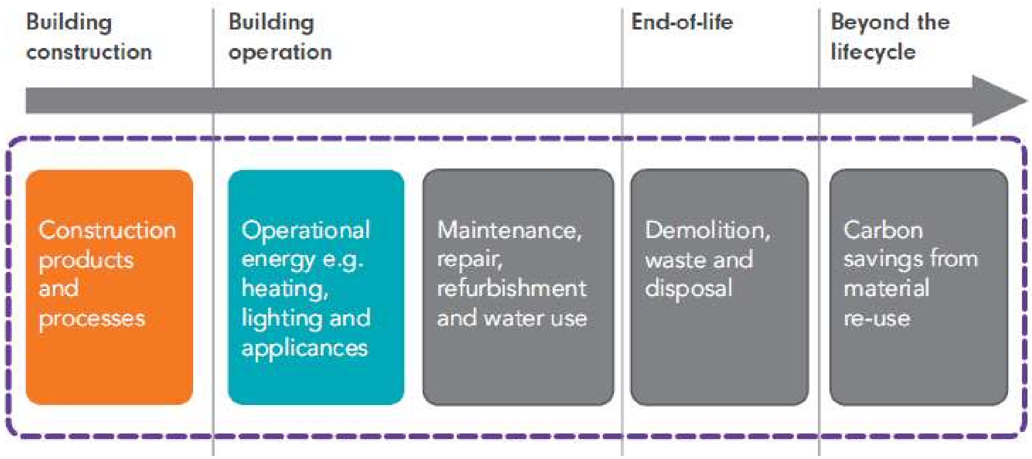
Low carbon construction…moving to net zero

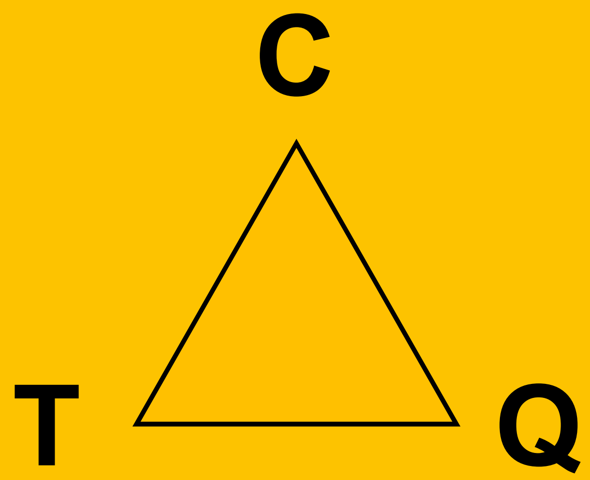
+ Energy efficiency - passivhaus
+ Eliminating the performance gap
+ Giving up on gas



UK GBC

Why building energy performance matters

+ Customer
+ Product
+ Growth
+ Legacy
+ People



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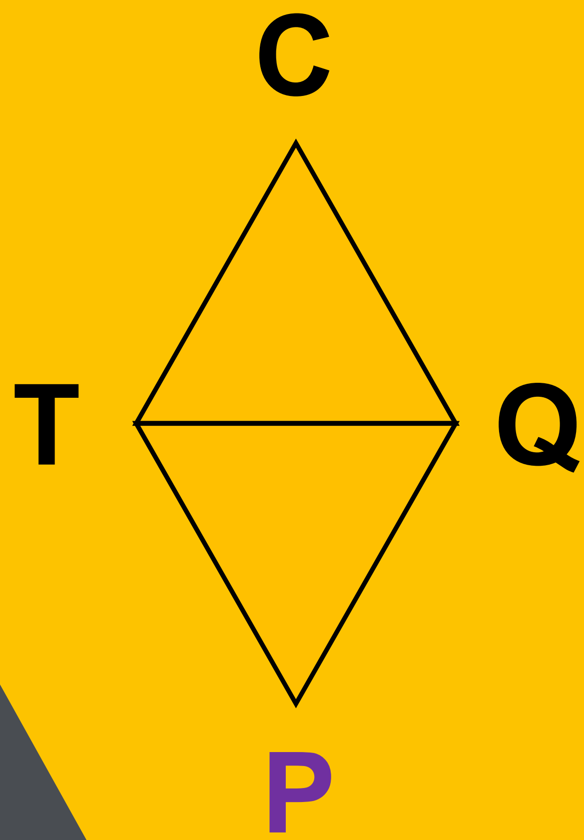

Energy efficiency – passivhaus

+ Very low energy demand
+ Excellent indoor environment
+ Build quality and performance focus

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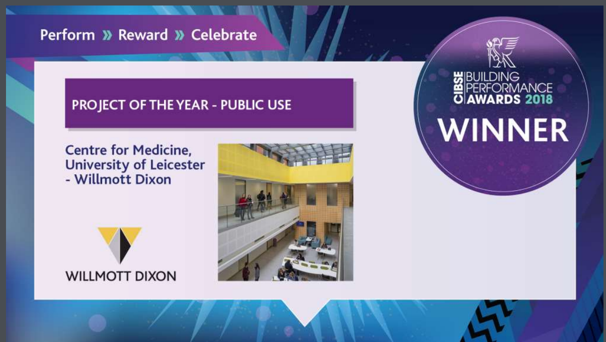

Energy efficiency – passivhaus

Maurice Shock Building

- 320kWhr/m2 per annum space heating
- 500kWhr/m2 per annum total energy

- £360,000 per annum energy bill

George Davis Centre/Centre for Medicine

- 32kWhr/m2 per annum space heating
- 72kWhr/m2 per annum total energy

- £42,000 per annum energy bill

UNIVERSITY OF LEICESTER

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Eliminating the performance gap

££ ☺

Expected Performance

Actual Performance

££ ☹

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Eliminating the performance gap

££ ☺

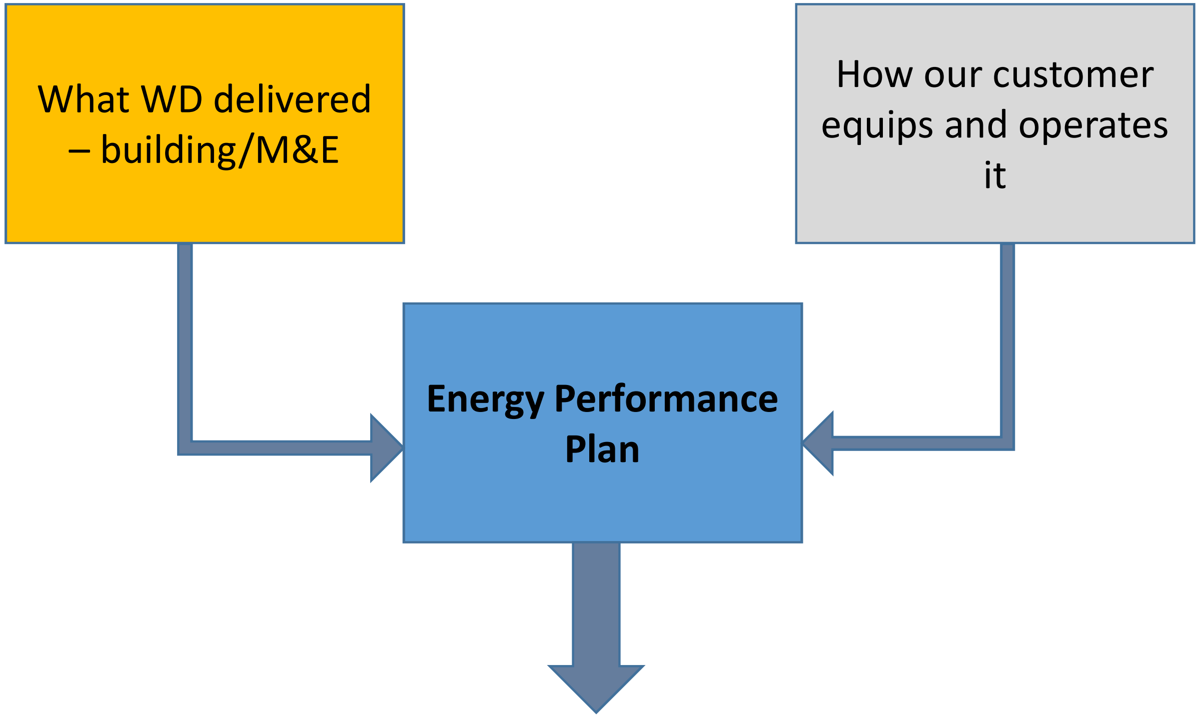
Expected Performance

Actual Performance

££ ☹

Energy Synergy

……delivering better energy performance outcomes



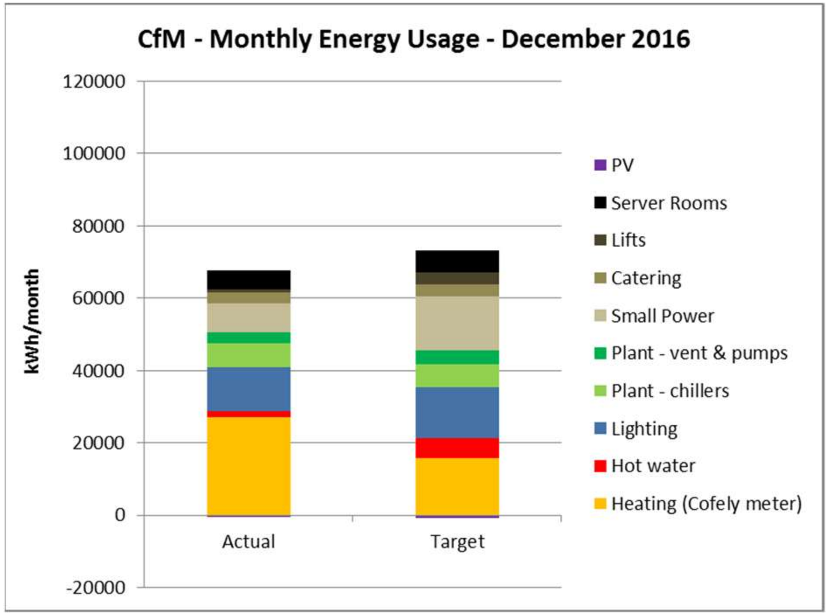
Monitor & manage energy performance

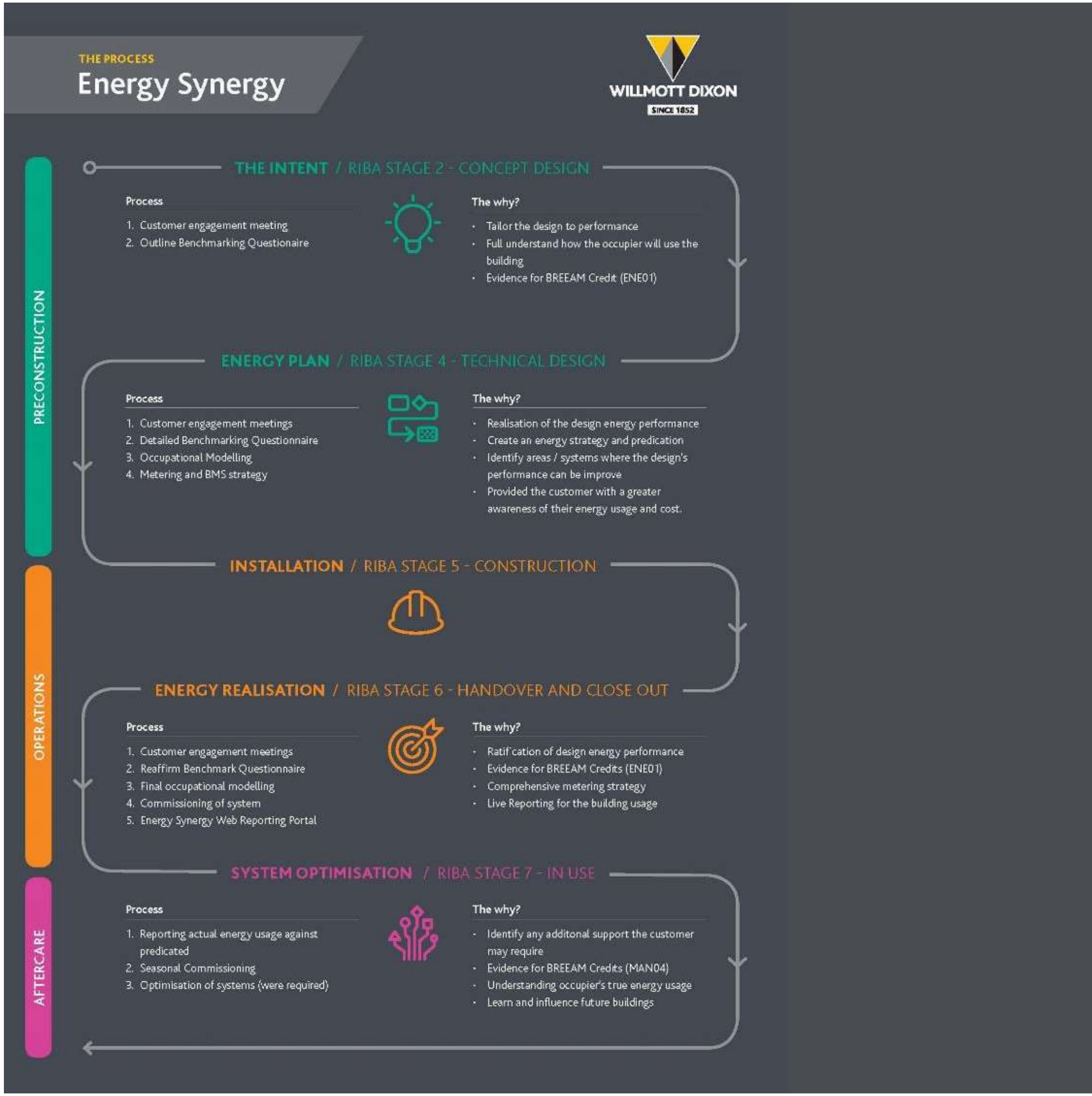
Improved outcomes for customers

Energy Synergy

Process map

Performance = Engagement + M odelling / M etering / M onitoring / M anagement





Energy Synergy

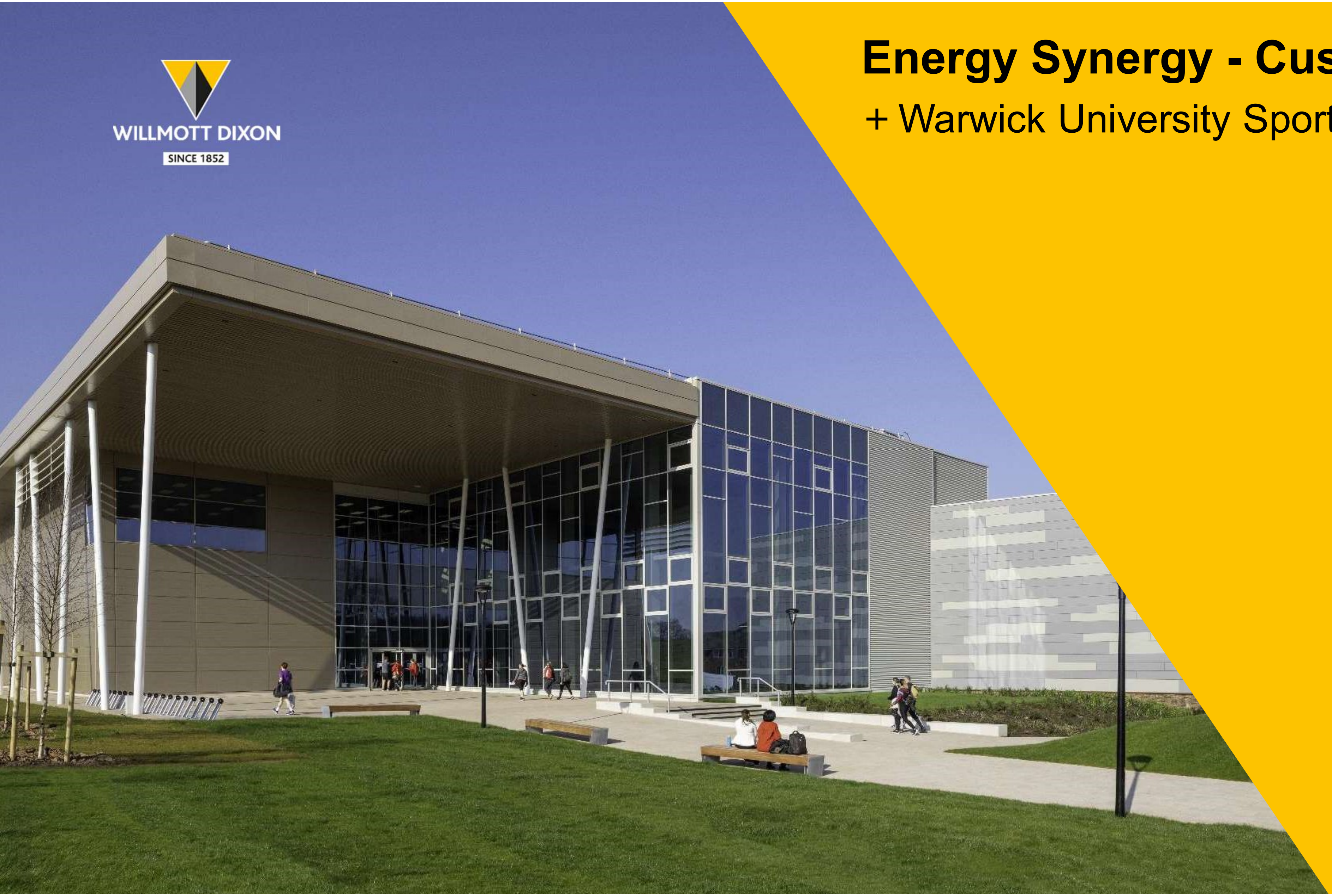
Pilot Projects

- 20+ pilot projects underway across multiple business sectors
- Learning from doing…..

LCO/Business	Sector	~Value £m	PC date	Full ES pilot	Monitoring only pilot	Potential pilot
Midlands	Police/ambulance/fire	18	Aug-19			
	Leisure centre/HE	36	Mar-19			
	Science building/HE	33	Mar-20			
	Leisure centre/pool	14	Dec-20			
	Higher Education	48	Mar-20			
	Offices					
	Police					
SL&SE	Sec. School	38	Jul-19			
	Sec. School	23	Apr-19			
	Higher Education	10	Jul-20			
	SEN School					
Central South	Higher Education	19	Jul-19			
	Leisure centre/pool	35	Dec-20			
	Higher Education	38				
	Primary School	8	Aug-20			
NL&E	Higher Education	13	Sep-18			
	Primary care centre	17	Apr-20			
	Higher Education					
	Primary care centre					
	Leisure centre/residential					
	Leisure centre/pool					
	Police					
	Offices					
North	Higher Education	10	Oct-19			
	Leisure centre/pool	16	Oct-20			
	Police	14	Dec-18			
	Police	45				
	Leisure centre/pool	5	Mar-18			
	Offices/café					
	Further Education					
	Secondary school					
	Leisure centre/pool	10				
	Office					
	Office	13				
Wales & West	Primary School	24	Mar-18			
	Higher Education	7	Nov-18			
	Police HQ	25	Jan-20			
	Offices (refurb)	9	May-20			
	Higher Education	21				
	Further Education					
	Secondary School					
	Higher Education					
	Police Training Centre					
WDC National	Primary care centre					
	Leisure centre/pool					
	Primary school (modular)					
	Secondary school					
WD Interiors	Secondary School (refurb)	23	Aug-19			
	Various(refurb)					
	Offices (refurb)					
	Library/museum					

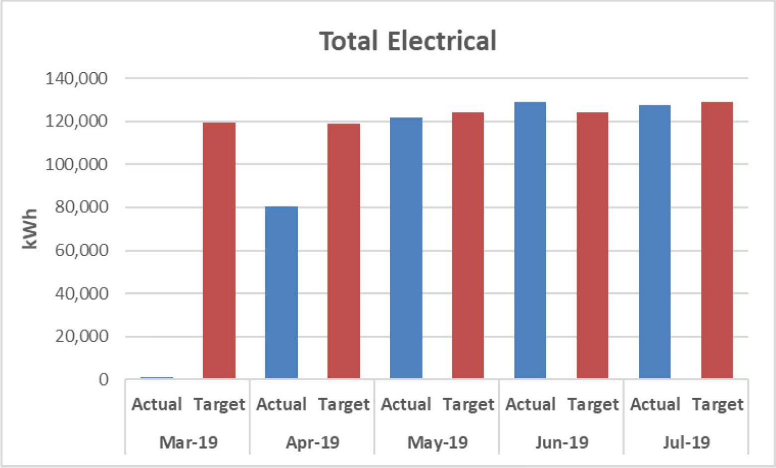
Energy Synergy - Customer

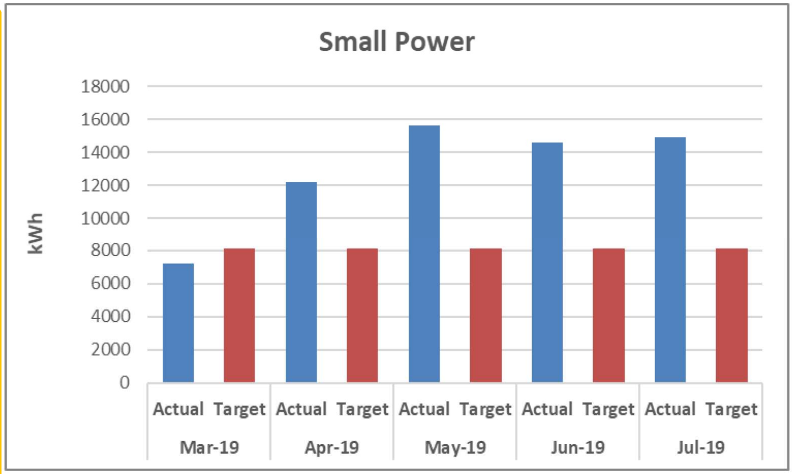
+ Warwick University Sports Hub

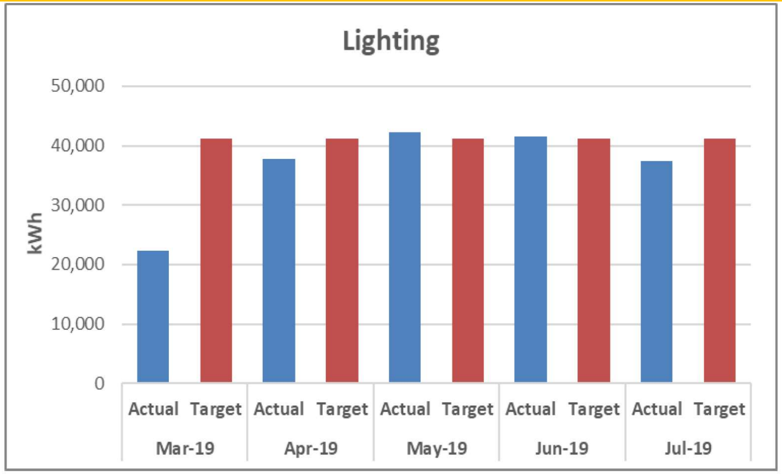


Energy Synergy - Customer

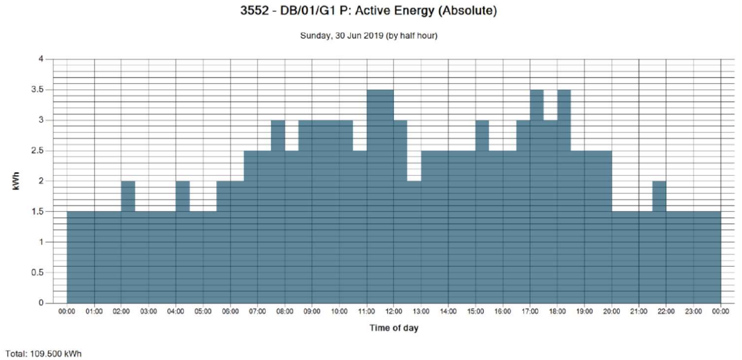
+ Warwick University Sports Hub







Sunday



- Sunday working hours: 7am to 8pm
- Out of Hours 38kWh or 35% of daily usage takes place after hours.

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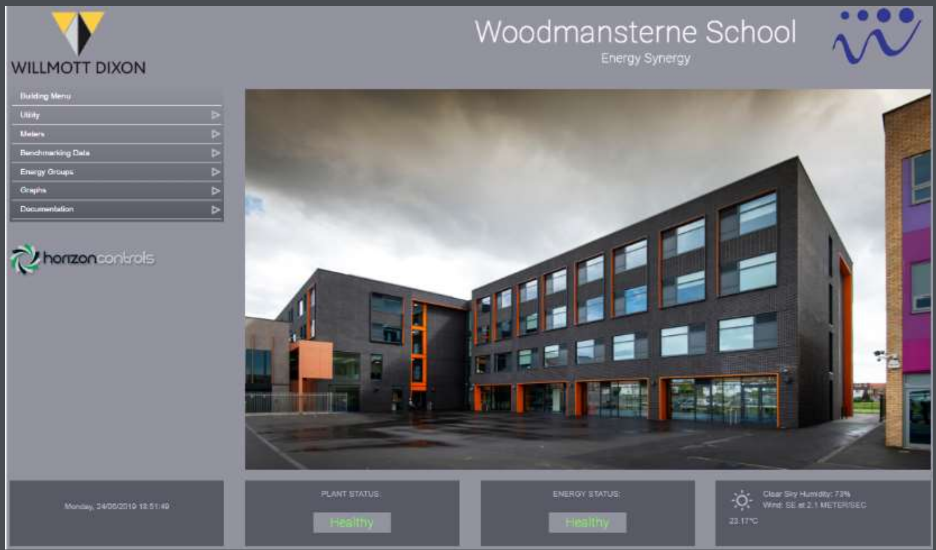
Energy Synergy - Product



Energy management portal

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Giving up on gas

grams CO_{2e} / kWh	SAP 2012 October 2013	SAP 10.0 July 2018	SAP 10.1 October 2019
Mains Gas	216	210	210
Electricity	519	233	136

	Gas	Grid electricity
Emissions/carbon	☹	☺
Fuel cost	☺	☹

Ashton Rise

133 new homes

Social rental / private sale mix

2 storey homes / 3 storey apartments

Ashton Rise

Heat strategy options
Gas combi boilers
LTHW heat network
ASHP
Shared loop GSHP

capex cost

efficiency

supplier risk

technical risk

carbon impact

opex cost

user issues

market impact

RHI value

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Ashton Rise

Shared Loop GSHP

+ No gas / net zero carbon ready
+ Affordable running costs
+ Clear landlord/occupier asset split
+ Renewable Heat Incentive payback of capex

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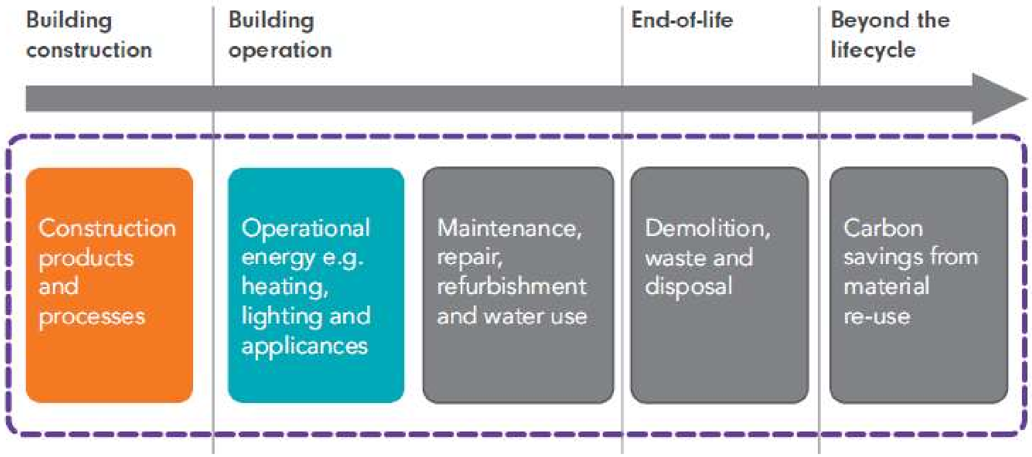

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