Achieving Carbon Zero

Richard Sulley
Senior Energy & Sustainability Manager, ENGIE

ENGIE: A leading Energy & Services Group

47,000
Business energy sites

14,000
FM customer sites

£3.8bn
UK turnover

8th largest
Overseas employer

17,000
Employees

Achieving Carbon Zero

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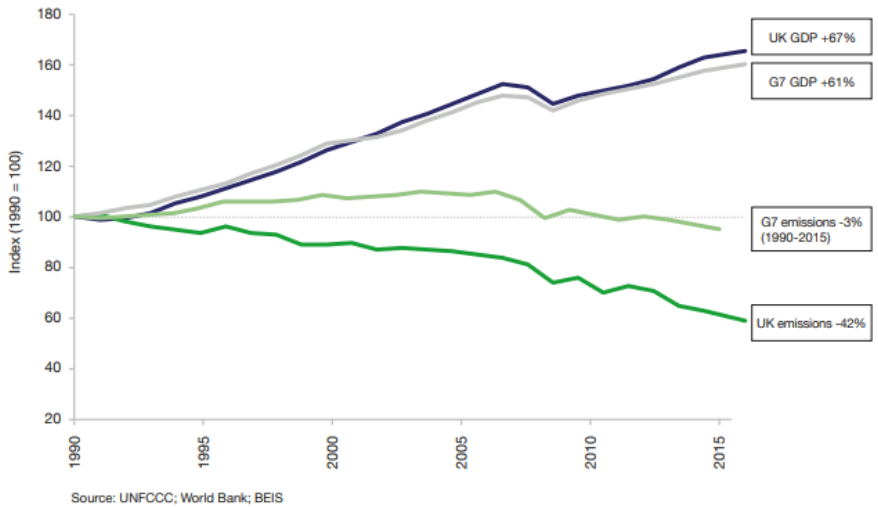
Senior Energy & Sustainability Manager
ENGIE Business Energy & Services

01

Carbon Zero in a Business Context

The Clean Growth Strategy: Leading the way to a low carbon future

Figure 1: UK and G7 economic growth and emissions reductions[8]

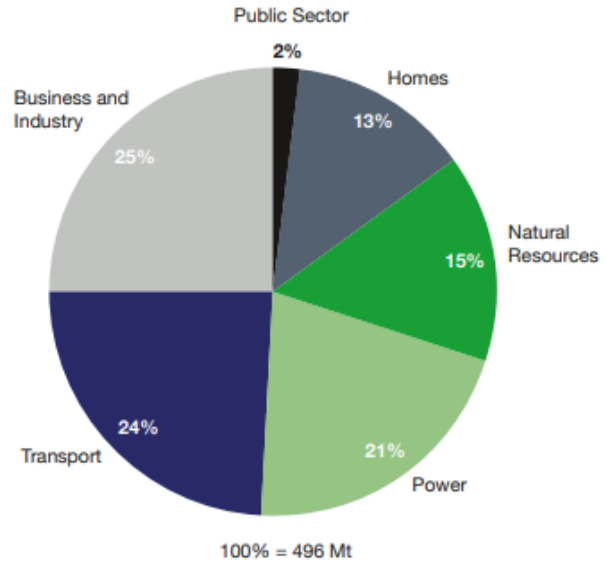


Source: UNFCCC; World Bank; BEIS

"This Government is determined to leave our natural environment in a better condition than we found it. Clean growth is not an option, but a duty we owe to the next generation, and economic growth has to go hand-in-hand with greater protection for our forests and beaches, clean air and places of outstanding natural beauty."

Executive Summary

Clean growth means growing our national income while cutting greenhouse gas emissions. Achieving clean growth, while ensuring an affordable energy supply for businesses and consumers, is at the heart of the UK's Industrial Strategy. It will increase our productivity, create good jobs, boost earning power for people right across the country, and help protect the climate and environment upon which we and future generations depend.



The Clean Growth Strategy: Leading the way to a low carbon future

- Improving Business and Industry Efficiency – 25% of UK Emissions.
- Support businesses to improve their energy productivity, by at least 20 per cent by 2030.
- Establish an industrial energy efficiency scheme to help large companies install measures to cut their energy use and bills.
- Publish joint industrial decarbonisation and energy efficiency action plans with seven of the most energy intensive industrial sectors.
- Demonstrate international leadership in carbon capture usage and storage (CCUS) by collaboration with partners.
- Work in partnership with industry, through a new CCUS Council.
- Develop a strategic approach to greenhouse gas removal technologies.
- Phase out the installation of high carbon forms of fossil fuel heating in new and existing businesses off the gas grid during the 2020s.
- Support the recycling of heat produced in industrial processes, to reduce business energy bills and benefit local communities.
- Invest around £162 million of public funds in research and innovation in energy, resource and process efficiency.

The Financial Risks of Climate Change

Bank of England governor Mark Carney and France's François Villeroy de Galhau set out the dangers to the global economy in an open letter on 17th April 2019.

The NGFS* sets out three climate-related financial risks that companies, banks and governments need to fight against.

Physical: These are the immediate problems caused by increasingly frequent climate and weather-related events - such as severe droughts or cyclones that affect crops.

Transition: For example, when a business moves away from carbon-intensive industries and technologies in a "sudden or disorderly" way, their business models and asset valuations can end up taking a hit.

Liability: When people or businesses claim compensation for losses suffered from either the physical or transition risks, which can have a huge impact on insurers.

"If some companies and industries fail to adjust to this new world, they will fail to exist. "

*Network for Greening the Financial System

Societal Pressures

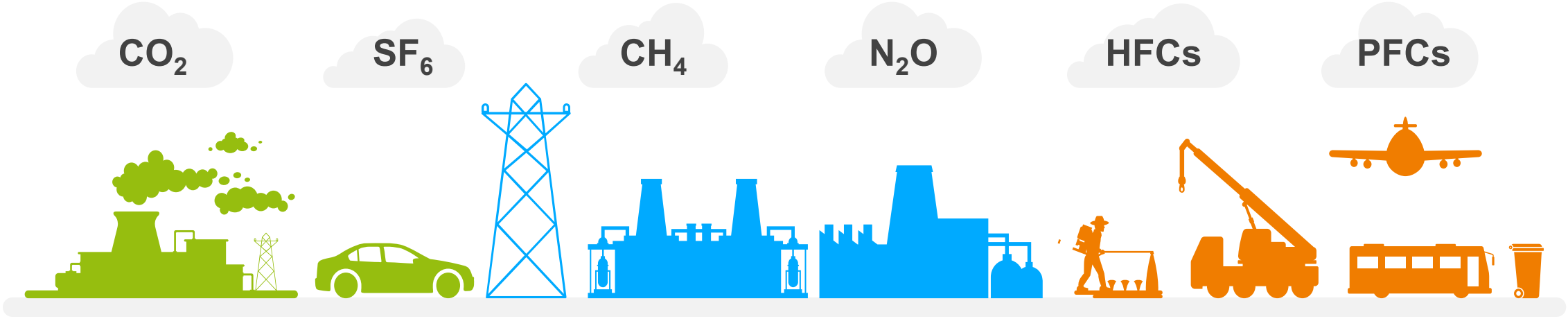
Climate activists have blockaded the London Stock Exchange by gluing themselves across the entrances. **25th April 2019**

'You did not act in time': Greta Thunberg addresses MPs at the Houses of Parliament. **23rd April 2019**

02

How Can it Be Achieved?

Where are your emissions from?



SCOPE 1

Direct emissions

Fuel combustion
Owned vehicle fleet
Fugitive emissions

SCOPE 2

Energy indirect emissions

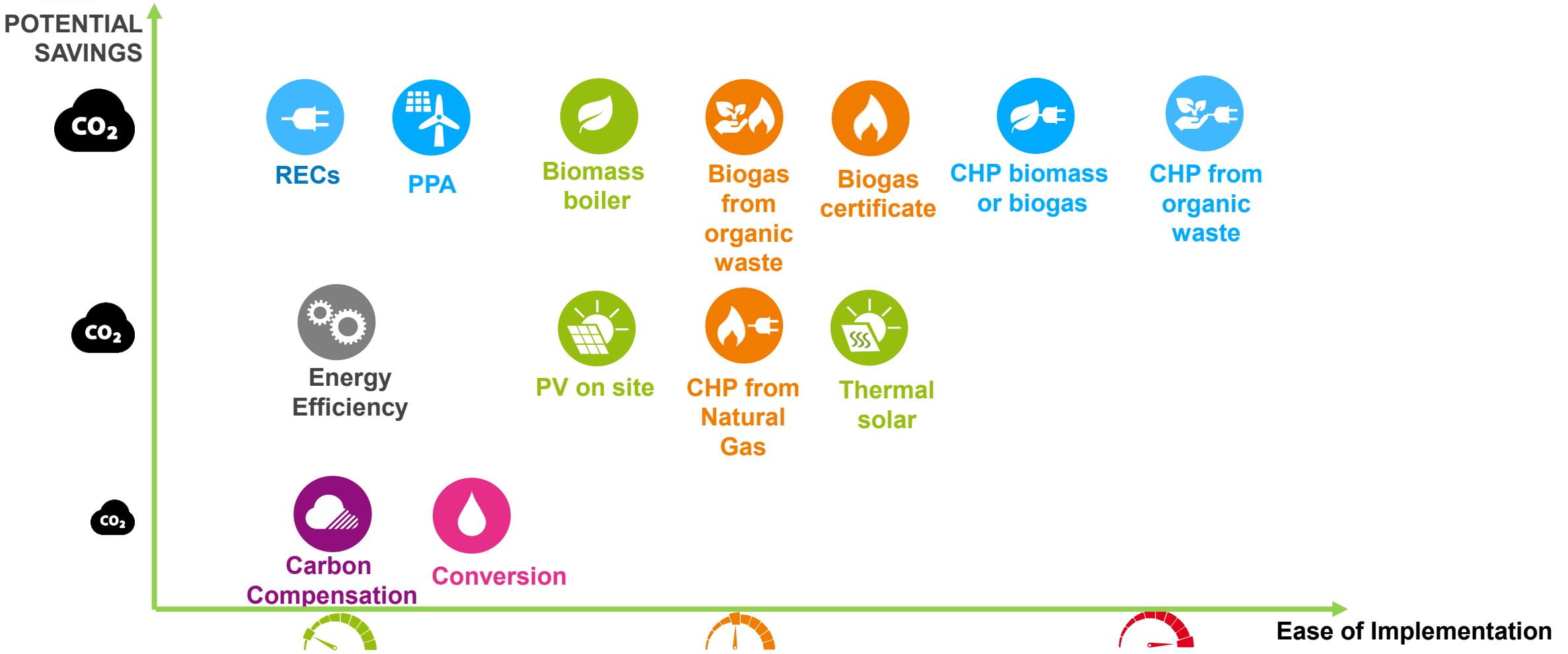
Purchased electricity for own use
Purchased heat, steam, cooling for own use

SCOPE 3

Other indirect emissions

Purchased goods and services
Product use
Waste disposal
Transportation and distribution
Employee business travel

Where are your reductions coming from?



The Law of Unintended Consequences

Unexpected benefit:
A positive unexpected benefit.

Unexpected drawback:
An unexpected detriment occurring in addition to the desired effect of the policy.

Perverse result:
A perverse effect contrary to what was originally intended.

03

A Methodology

Understanding the Sources

BREAKDOWN OF EMISSIONS FROM SCOPE 1 & 2

433,414 tCO_2e

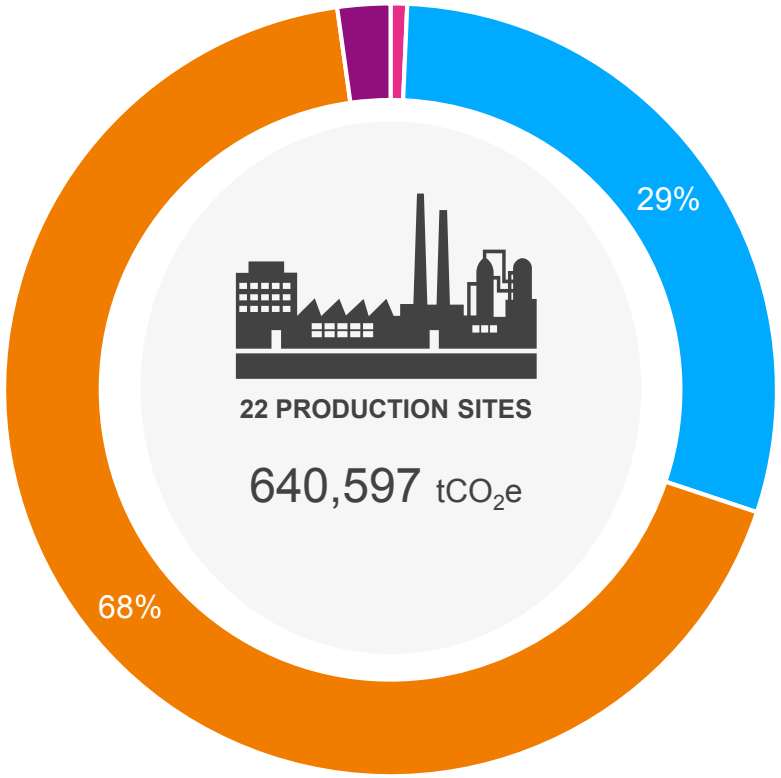
Emissions from **Natural Gas**

4,420 tCO_2e

Emissions from **Light Fuel Oil**

0 tCO_2e

Emissions from **Bioliquid**



188,606 tCO_2e

Emissions from the **Electricity grid**

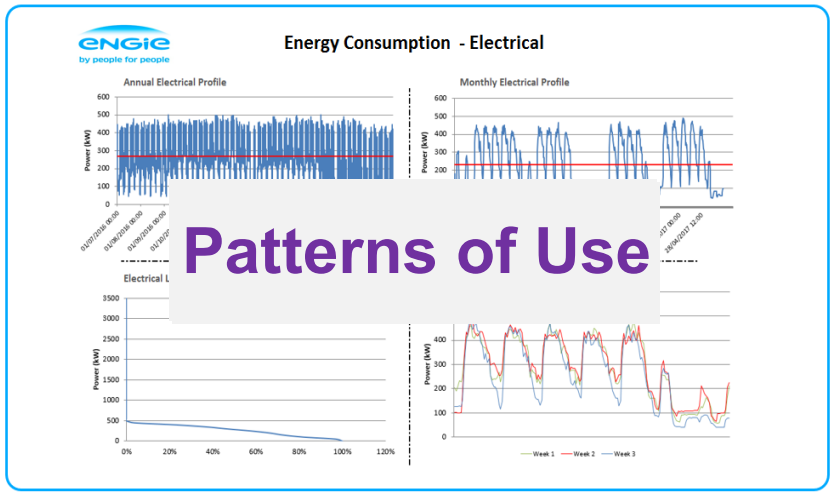
14,157 tCO_2e

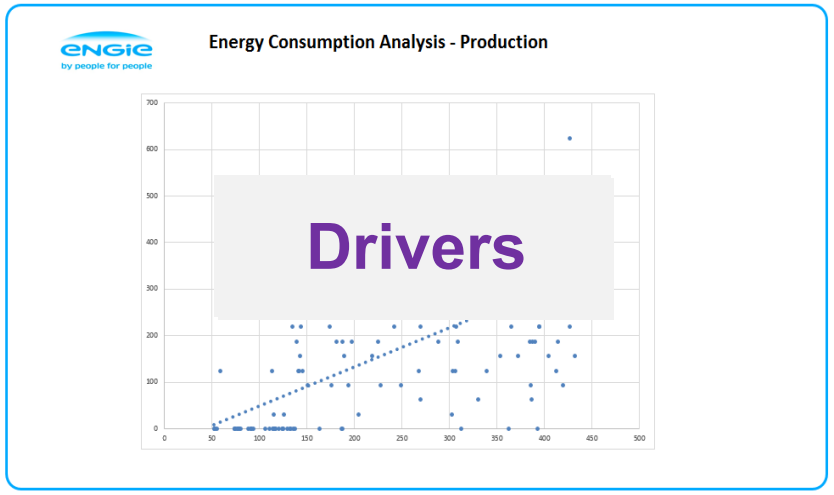
Emissions from **Purchased Heat**

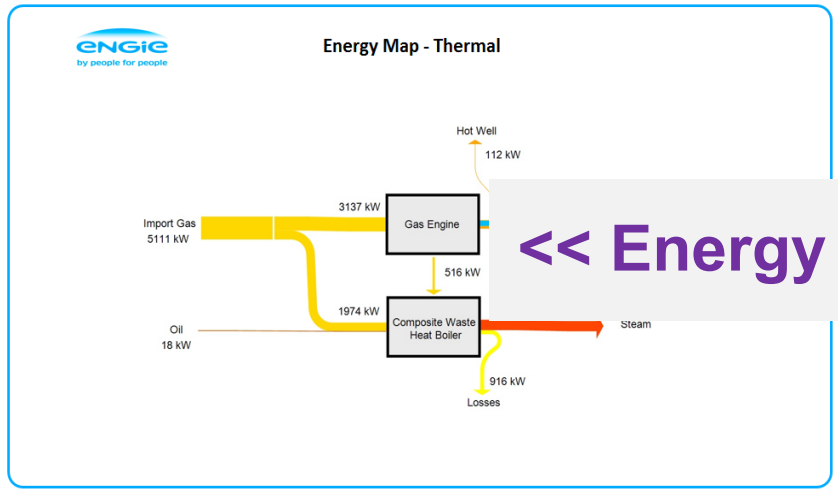
Turning savings opportunities into a sustainable carbon strategy

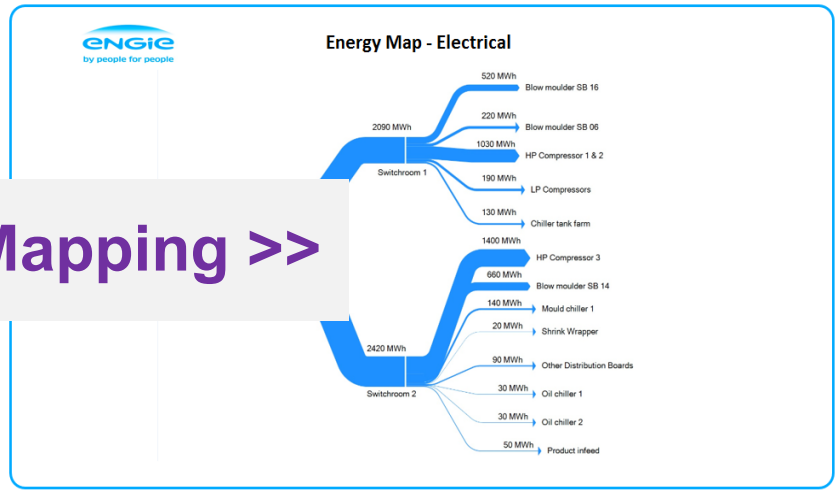
- Baselines
- Targets
- Opportunities
- Alignment & Prioritisation
- Implementation
- Review

Energy Analysis: Baseline





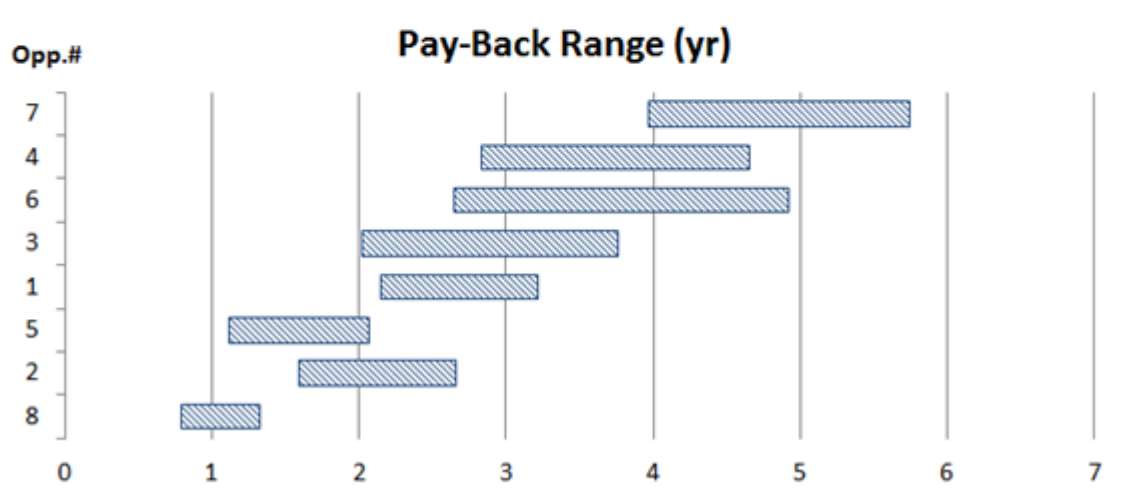


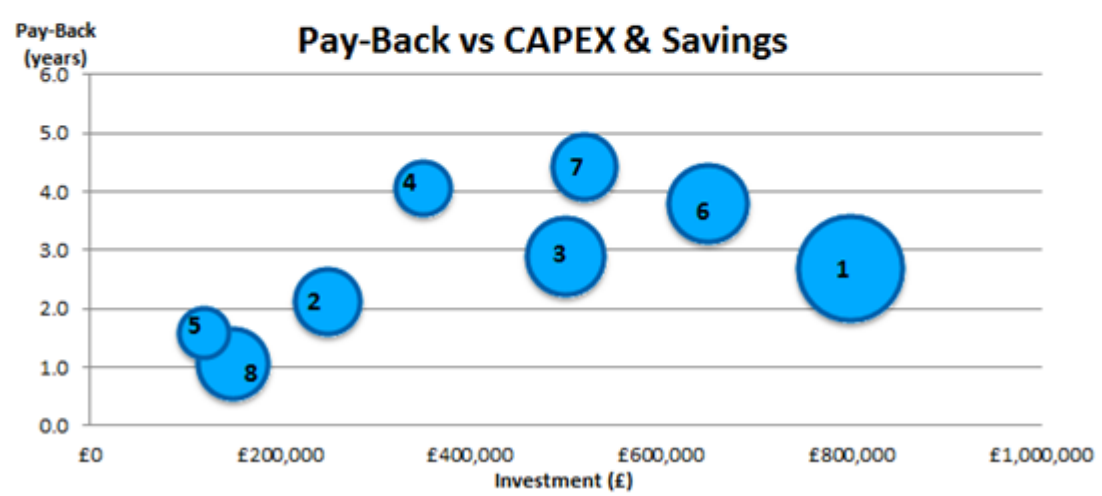


<< Energy Mapping >>

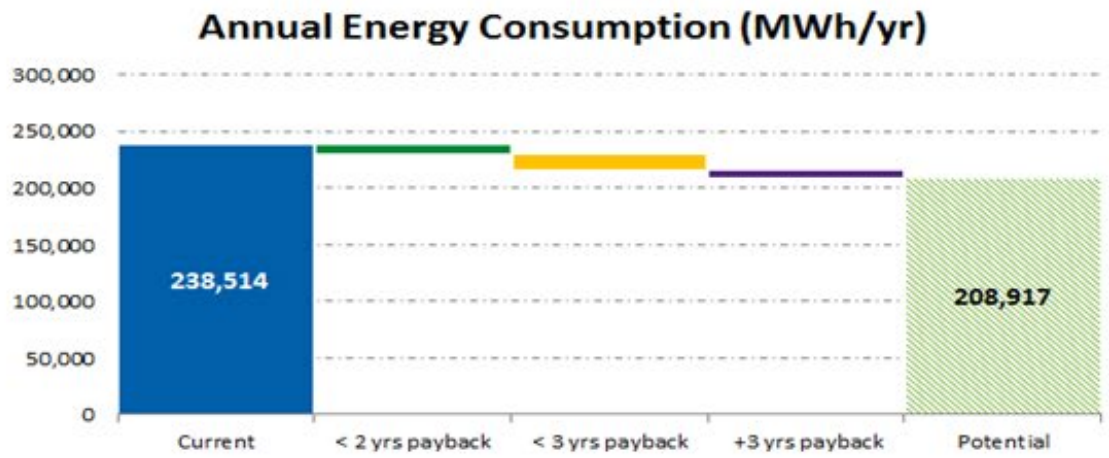
Efficiency Opportunities Exploration

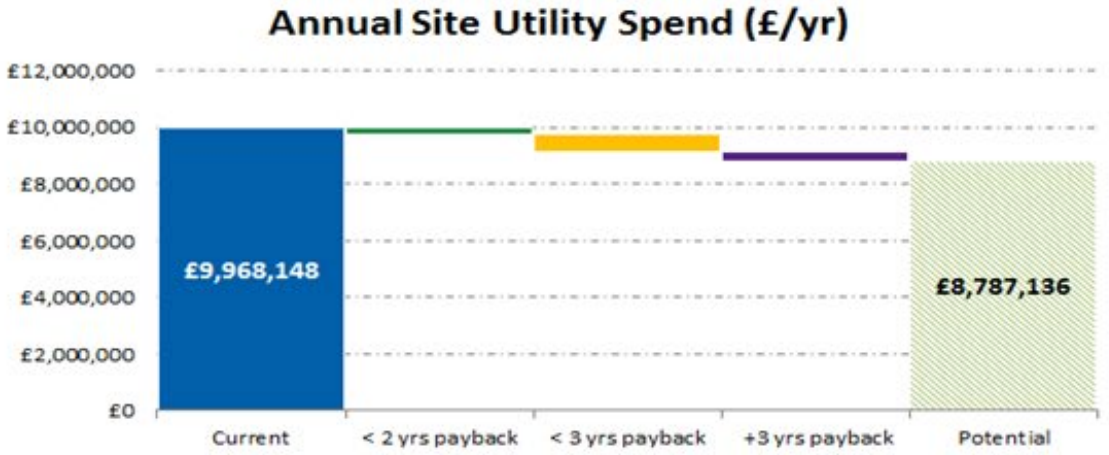
ECM No	Project	Electrical Saving (kWh)	Gas Saving (kWh)	Water Saving (m^3)	Effluent Saving (m^3)	CO_2 Saving (te)	Financial Benefit (£)	Budget Capital Cost (£)	Simple Payback (yr)
8	Baseline reduction	1,185,279	2,866,540	0	0	1016	£141,333	£150,000	1.1
2	Cooling Towers Optimisation	1,422,000	0	0	0	586	£117,728	£250,000	2.1
5	Steam Production Optimisation	5,000,000	0	0	0	2060	£75,358	£120,000	1.6
1	Lighting Upgrade	501,148	0	0	0	206	£298,045	£800,000	2.7
3	Pre-Heat Process Hot Water	11,466,160	0	0	0	4725	£172,812	£500,000	2.9
6	DAF Plant Upgrade	0	0	50000	50000	0	£171,575	£650,000	3.8
4	CIP Heat Recovery	0	5,733,080	0	0	1055	£86,406	£350,000	4.1
7	New VSD Compressors	1,422,335	0	0	0	586	£117,756	£520,000	4.4
Total		20,996,921	8,599,620	50,000	50,000	10,234	1,181,013	3,340,000	2.8

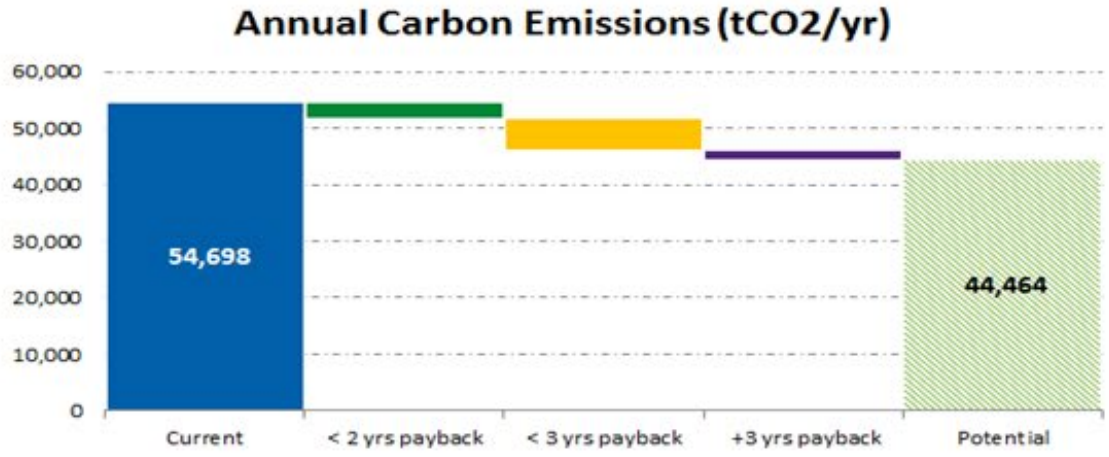


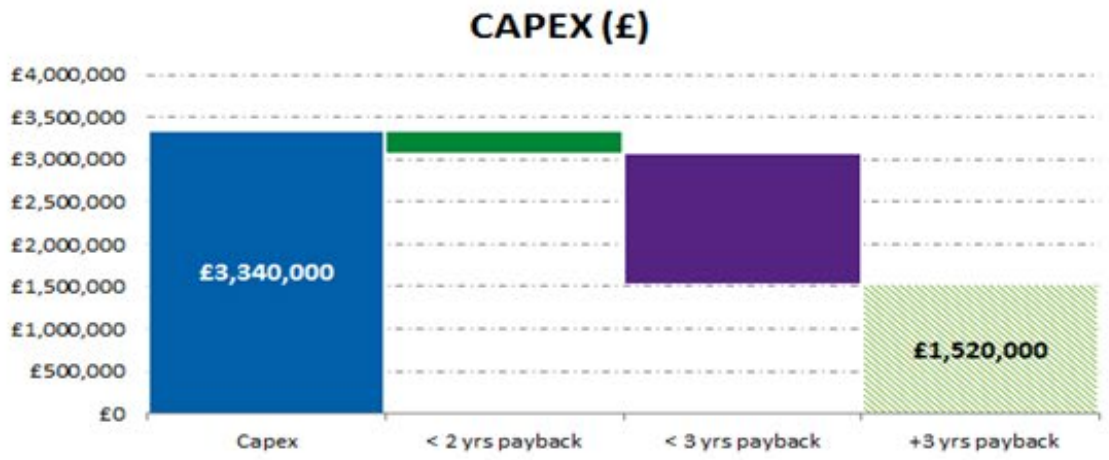


Baseline and Opportunities Impact





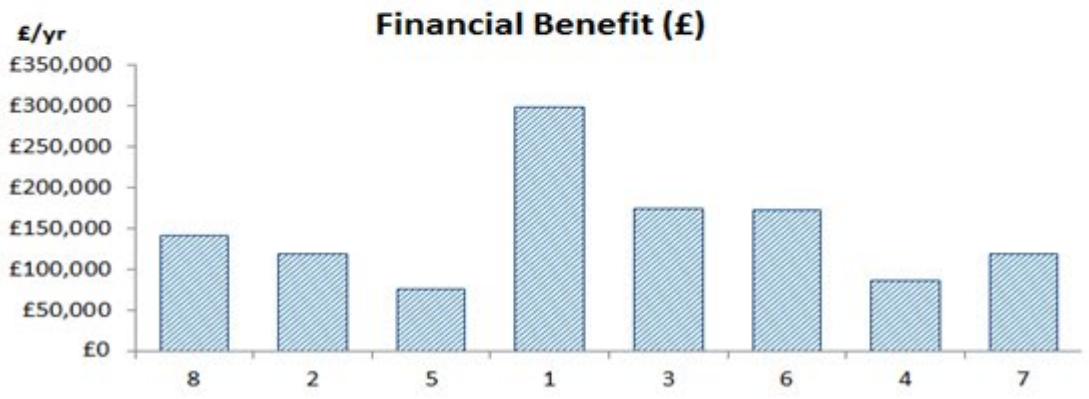


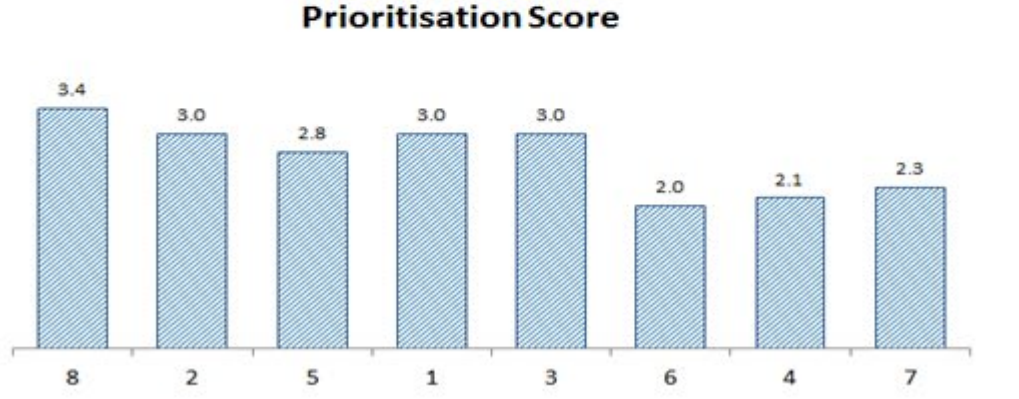


Opportunities Alignment and Prioritisation

	Relative weight			
	25%	50%	15%	10%
Rating	Financial Benefit	Payback	Readiness	Implementation
1	< £10k	> 5 yrs	Considerable project develop/	Difficult
2	£10k - £100k	3 - 5 yrs	Project develop/	Slightly Difficult
3	£100k - £500k	1 - 3 yrs	Low further develp/	Slightly Easy
4	£500k >	less than < 1 yr	Immediate	Easy

ECM No	Project	Financial Benefit (£)	Simple Payback (yr)	Financial Benefit	Payback	Readiness	Implementation	Prioritisation Score
8	Baseline reduction	£141,333	1.1	3	4	2	3	3.4
2	Cooling Towers Optimisation	£117,728	2.1	3	3	3	3	3.0
5	Steam Production Optimisation	£75,358	1.6	2	3	3	3	2.8
1	Lighting Upgrade	£298,045	2.7	3	3	3	3	3.0
3	Pre-Heat Process Hot Water	£172,812	2.9	3	3	3	3	3.0
6	DAF Plant Upgrade	£171,575	3.8	3	2	1	1	2.0
4	CIP Heat Recovery	£86,406	4.1	2	2	2	3	2.1
7	New VSD Compressors	£117,756	4.4	3	2	2	2	2.3
	Total	1,181,013	2.5					





Implementation Planner

Concept / Business Case
FEED
Construction and Handover

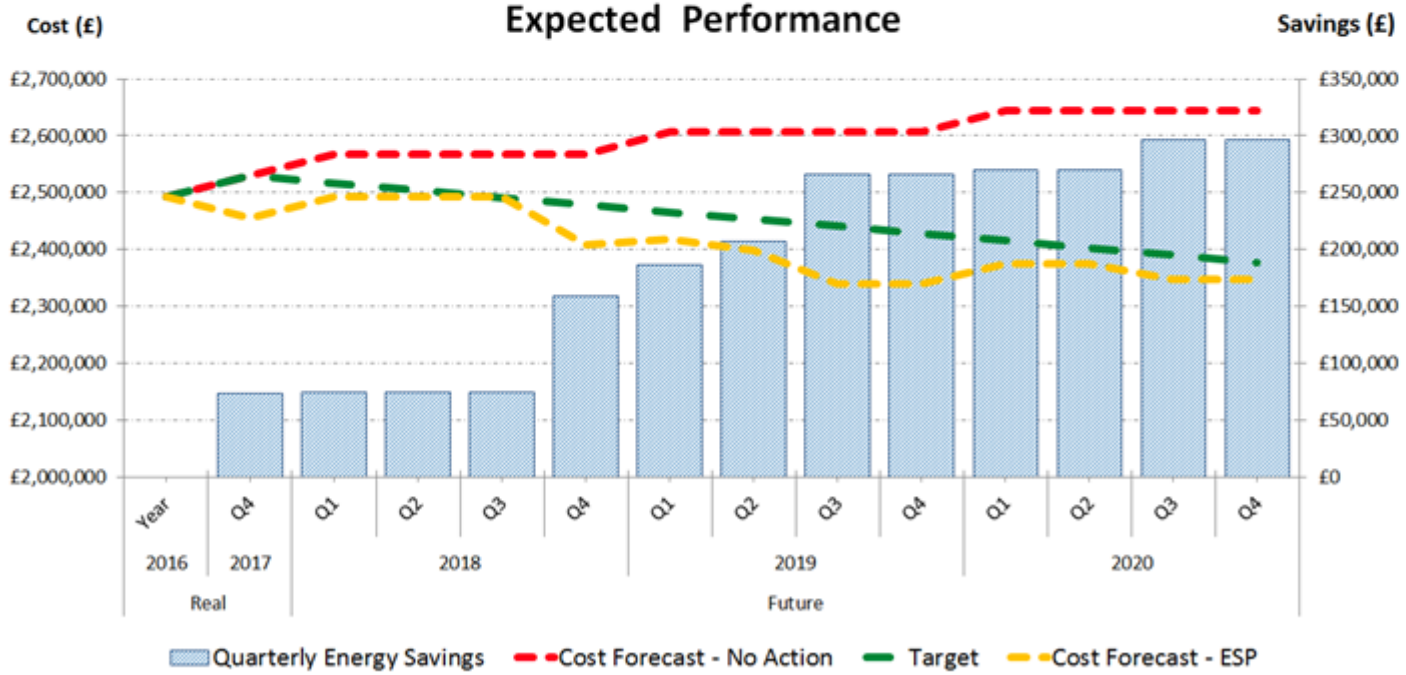
Opportunity	GO/NO GO?	Achieved Savings	Utility	Units	Savings	2017 Q4	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4
Lighting Upgrade		100%	Electricity	kWh	1,200,000					£25,588	£25,972	£25,972	£25,972	£25,972	£26,361	£26,361	£26,361	£26,361
			Total Savings							£25,588	£25,972	£25,972	£25,972	£25,972	£26,361	£26,361	£26,361	£26,361
Lighting Phase 2		100%	Electricity	kWh	1,200,000						£25,972	£25,972	£25,972	£25,972	£26,361	£26,361	£26,361	£26,361
			Total Savings								£25,972	£25,972	£25,972	£25,972	£26,361	£26,361	£26,361	£26,361
Lighting Phase 3		100%	Electricity	kWh	1,200,000												£26,361	£26,361
			Total Savings														£26,361	£26,361
Cooling Towers Optimisation		100%	Electricity	kWh	1,422,000					£30,322	£30,776	£30,776	£30,776	£30,776	£31,238	£31,238	£31,238	£31,238
			Total Savings							£30,322	£30,776	£30,776	£30,776	£30,776	£31,238	£31,238	£31,238	£31,238
Pre-Heat Process Hot Water		100%	Gas	kWh	11,466,160	£43,851	£44,509	£44,509	£44,509	£44,509	£45,177	£45,177	£45,177	£45,177	£45,854	£45,854	£45,854	£45,854
			Total Savings			£43,851	£44,509	£44,509	£44,509	£44,509	£45,177	£45,177	£45,177	£45,177	£45,854	£45,854	£45,854	£45,854
CIP Heat Recovery		100%	Gas	kWh	5,733,080								£22,588	£22,588	£22,927	£22,927	£22,927	£22,927
			Total Savings										£22,588	£22,588	£22,927	£22,927	£22,927	£22,927
Steam Production Optimisation		100%	Gas	kWh	5,000,000							£19,700	£19,700	£19,700	£19,995	£19,995	£19,995	£19,995
			Total Savings									£19,700	£19,700	£19,700	£19,995	£19,995	£19,995	£19,995
DAF Plant Upgrade		100%	Water	m3	50,000					£13,935	£14,144	£14,144	£14,144	£14,144	£14,356	£14,356	£14,356	£14,356
			Effluent	m3	50,000					£13,935	£14,144	£14,144	£14,144	£14,144	£14,356	£14,356	£14,356	£14,356
			Total Savings							£27,871	£28,289	£28,289	£28,289	£28,289	£28,713	£28,713	£28,713	£28,713
New VSD Compressors		100%	Electricity	kWh	1,422,335	£29,880	£30,329	£30,329	£30,329	£30,329	£30,784	£30,784	£30,784	£30,784	£31,245	£31,245	£31,245	£31,245
			Total Savings			£29,880	£30,329	£30,329	£30,329	£30,329	£30,784	£30,784	£30,784	£30,784	£31,245	£31,245	£31,245	£31,245
Baseline reduction		100%	Electricity	kWh	1,185,279								£25,653	£25,653	£26,038	£26,038	£26,038	£26,038
			Gas	kWh	2,866,540								£11,294	£11,294	£11,464	£11,464	£11,464	£11,464
			Total Savings										£36,947	£36,947	£37,501	£37,501	£37,501	£37,501
Quarterly Savings						£73,732	£74,838	£74,838	£74,838	£158,618	£186,968	£206,668	£266,204	£266,204	£270,197	£270,197	£296,558	£296,558
Yearly Savings						£73,732	£383,130				£926,044				£1,133,510			

Utilities Cost Increase	2%
Target 2020	6.0%
Target 2020	£2,377,653
Result 2020	£2,348,399

Baseline & Performance Tracker

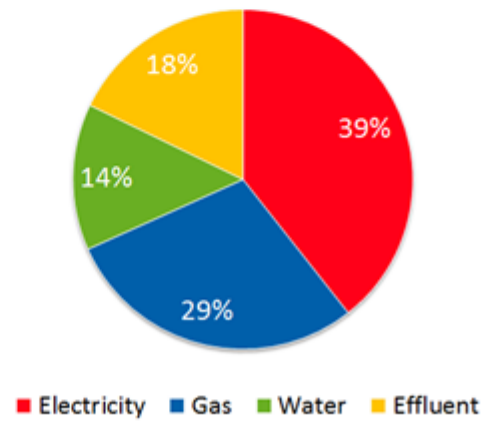
				Real		Future											
				2016	2017	2018				2019				2020			
Utility	Units	Usage	Cost (£)	Year	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Electricity	kWh	47,411,153	3,925,185	£981,296	£996,016	£1,010,956	£1,010,956	£1,010,956	£1,010,956	£1,026,120	£1,026,120	£1,026,120	£1,026,120	£1,041,512	£1,041,512	£1,041,512	£1,041,512
Gas	kWh	191,102,660	2,880,207	£720,052	£730,853	£741,815	£741,815	£741,815	£741,815	£752,943	£752,943	£752,943	£752,943	£764,237	£764,237	£764,237	£764,237
Water	m3	1,283,145	1,388,511	£347,128	£352,335	£357,620	£357,620	£357,620	£357,620	£362,984	£362,984	£362,984	£362,984	£368,429	£368,429	£368,429	£368,429
Effluent	m3	755,196	1,774,245	£443,561	£450,215	£456,968	£456,968	£456,968	£456,968	£463,822	£463,822	£463,822	£463,822	£470,780	£470,780	£470,780	£470,780
Cost Forecast - No Action				£2,492,037	£2,529,418	£2,567,359	£2,567,359	£2,567,359	£2,567,359	£2,605,869	£2,605,869	£2,605,869	£2,605,869	£2,644,957	£2,644,957	£2,644,957	£2,644,957
Target				£2,492,037	£2,529,418	£2,516,771	£2,504,123	£2,491,476	£2,478,829	£2,466,182	£2,453,535	£2,440,888	£2,428,241	£2,415,594	£2,402,947	£2,390,300	£2,377,653
Quarterly Energy Savings				£0	£73,732	£74,838	£74,838	£74,838	£158,618	£186,968	£206,668	£266,204	£266,204	£270,197	£270,197	£296,558	£296,558
Cost Forecast - ESP				£2,492,037	£2,455,686	£2,492,521	£2,492,521	£2,492,521	£2,408,741	£2,418,901	£2,399,201	£2,339,666	£2,339,666	£2,374,760	£2,374,760	£2,348,399	£2,348,399

Expected Performance

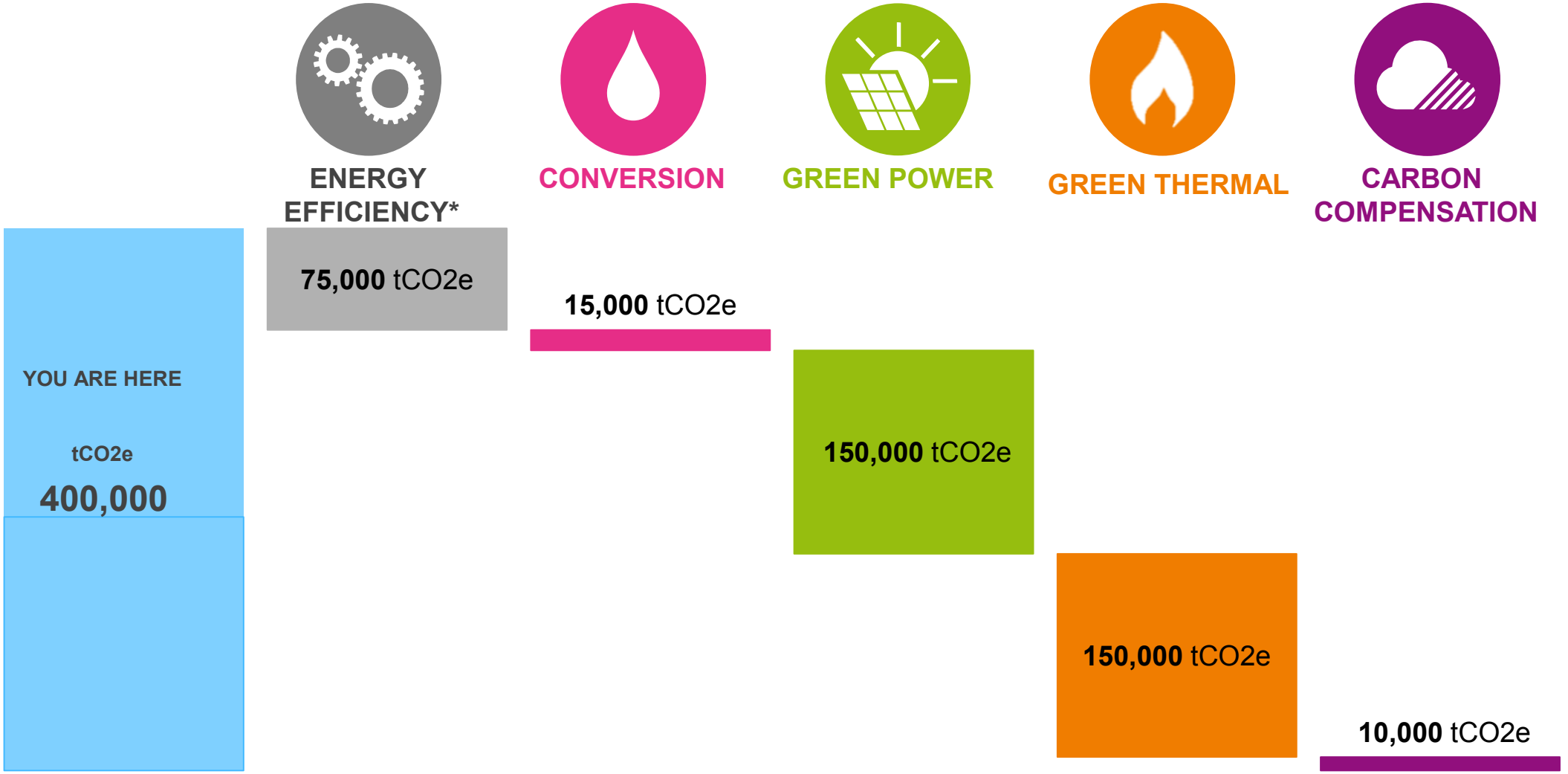


Utilities Cost Breakdown

Utility	2016	2017	2018	2019	2020
Electricity	£0.083	0.084	£0.085	0.087	£0.088
Gas	£0.015	0.015	£0.016	0.016	£0.016
Water	£1.082	1.098	£1.115	1.132	£1.149
Effluent	£2.349	2.385	£2.420	2.457	£2.494



Carbon Waterfall



REGOs and RGGOs

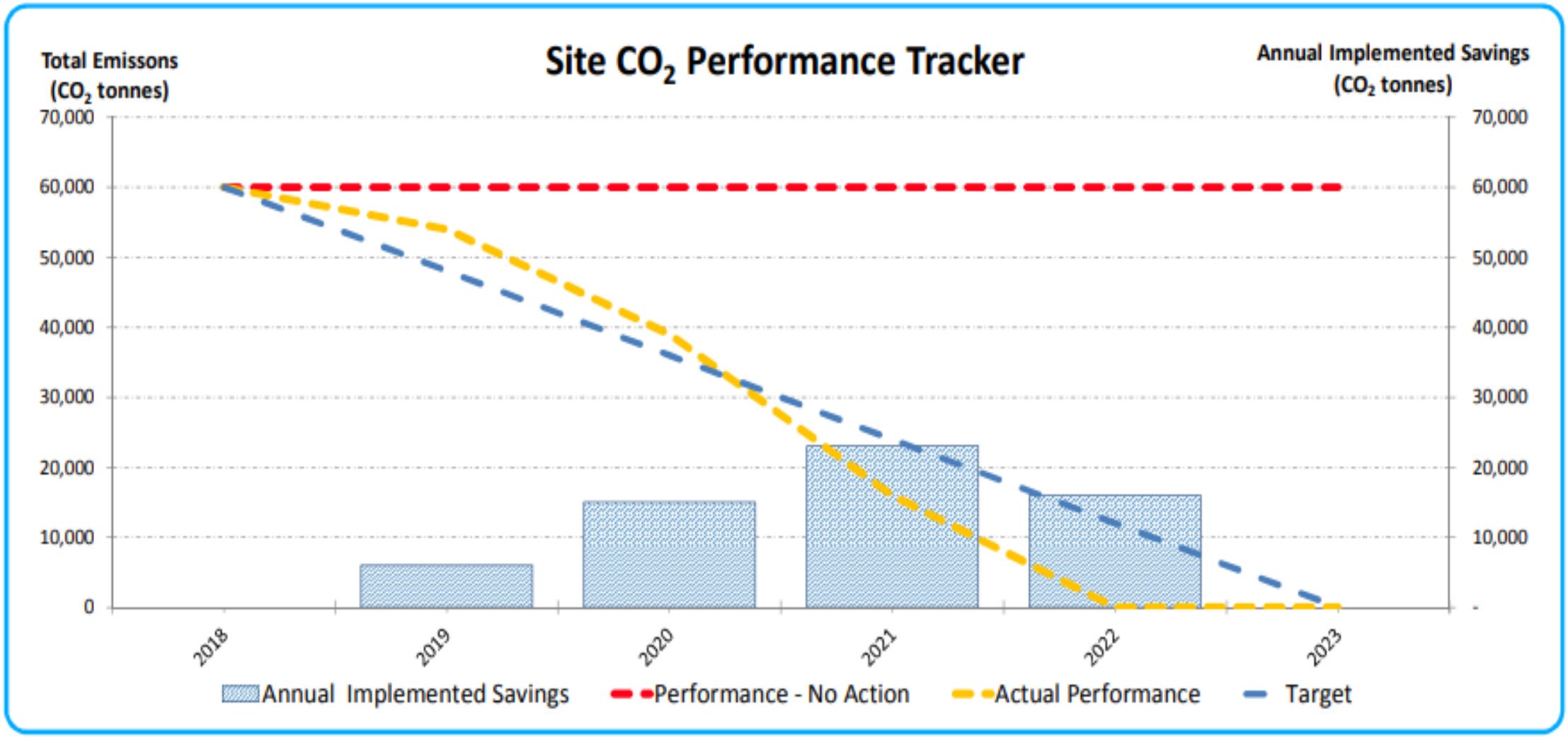
- Electricity you buy via renewable energy contracts comes from 100% renewable energy sources, such as wind or hydro-electric power – which produce zero carbon emissions and do not deplete finite natural resources.

- The origin of renewable electricity should be fully certified by UK Renewable Energy Guarantees of Origin (REGOs) or EU Guarantees of Origin (GoOs), meaning that all of the electricity you buy is fully traceable to specific renewable generators.

- “Green gas” is sourced from generation plants that produce biogas from anaerobic digestion or landfill waste gas. Biogas produces at least 46% less carbon emissions than standard natural gas, enabling you to reduce your carbon footprint.

- Renewable Gas Guarantee of Origin (RGGO), which identifies exactly where, when and how it was produced. This gives you complete traceability and assures you that your gas comes from authentic biogas sources.

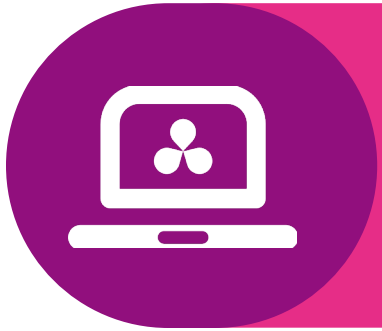
Performance Tracker



04

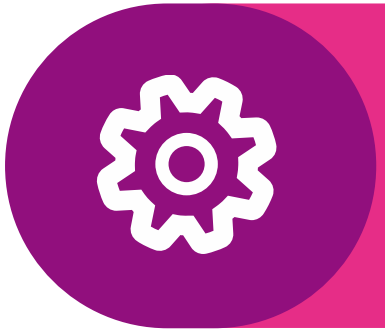
Streamlined Energy and Carbon Reporting (SECR)

SECR – Overview



The UK Government has published plans for Streamlined Energy and Carbon Reporting (SECR) regulations.

It outlines the new mandatory reporting framework which will replace the existing CRC Energy Efficiency Scheme.



The scheme targets about **11,900** companies.

SECR – Who needs to comply?

- All quoted companies.
- All large UK incorporated unquoted companies. To be considered as “a large company” a business must fulfil at least 2 of the following criteria within a financial year: employ at least 250 employees, have an annual turnover greater than £36m or an annual balance sheet total greater than £18m.
- All large LLPs.
- Companies using less than 40,000 kWh of energy in the reporting year will be exempted from SECR.
- UK subsidiaries that qualify for SECR in their own right, will not be required to report, if covered by a parent’s group report.
- Companies that are not registered in the UK are not required to report under SECR.
  - There will be an exemption from the scheme for unquoted companies when it would be not practical to obtain some or all of the SECR information.
  - There will be an exemption from disclosing information which the Directors think would be seriously prejudicial against the interests of the company.

How to Comply

- Include a report on carbon emissions **annually** in their **Directors Report.**

- The **reporting** must include:
  - **electricity, gas and transport** (Scope 1 and Scope 2 emissions) however Scope 3 emissions (business travel, waste, water, etc) will be optional.
  - at least one **intensity metric** such as **tCO2/employee.**
  - a **narrative** about **energy efficiency actions** taken in the financial year.

05

Carbon Zero as a Service

Zero – carbon transition

FINANCED

COST EFFECTIVE

SUPPORT CLIENTS' SUSTAINABILITY GOALS

"As a service"
integrated zero-carbon transition
solutions have CONSIDERABLE POTENTIAL

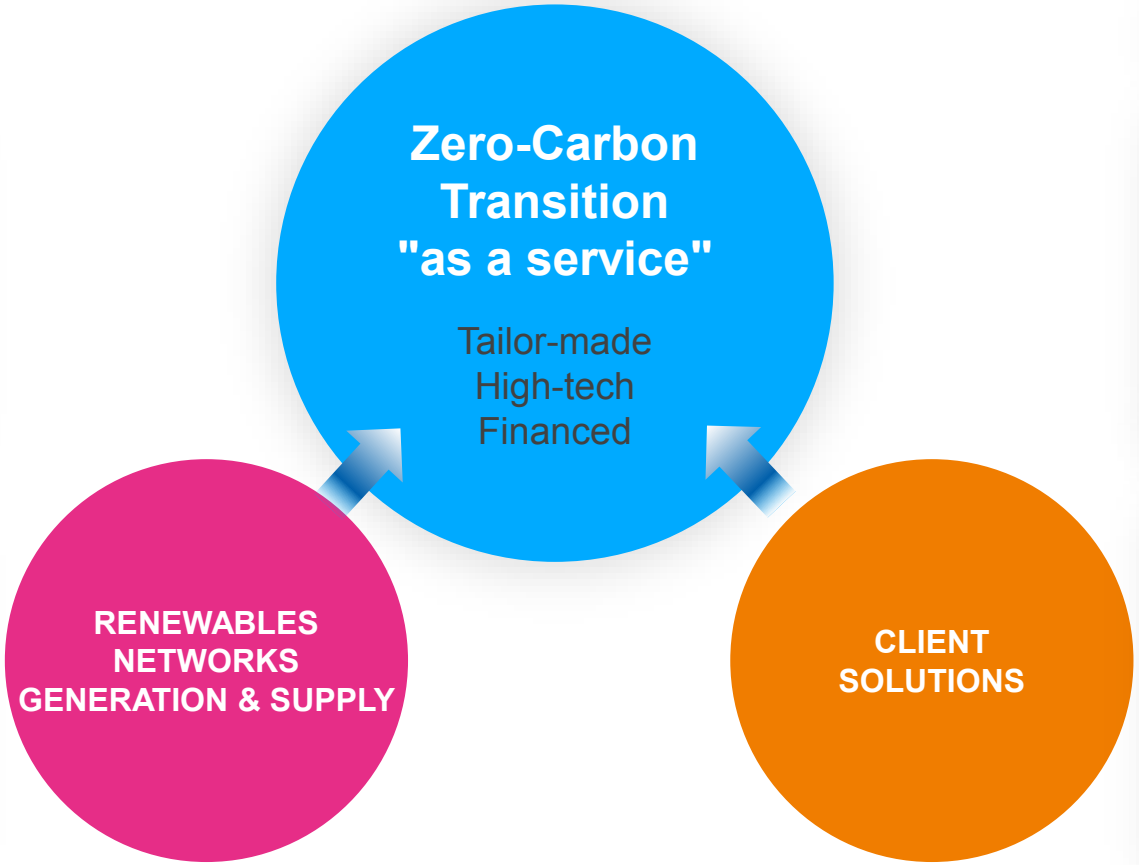
ENGIE is best positioned to be the world leader in zero-carbon transition “as a service”

RENEWABLES

- Sophisticated technologies, 50% new renewables projects dedicated to specific clients by 2021

NETWORKS

- Growth in dynamic development markets
- Priority to convert gas infrastructure to green gas



CLIENT SOLUTIONS

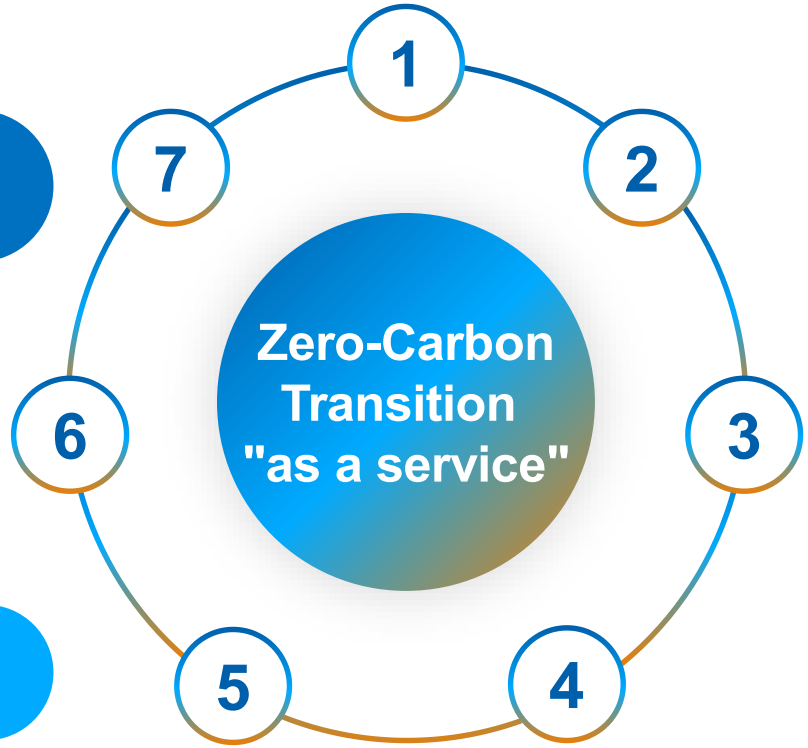
- Asset-based solutions a rising proportion of Client Solution COI

GENERATION & SUPPLY

- Further reduction in thermal capacity led by continuing disposals of coal generation

A harmonised approach to create integrated solutions “as a service" with higher added value

By creating high value added offers



CUSTOMER REQUIREMENTS

Understand holistic customer needs

OVERHAUL & REINVENT ENERGY USES

Save energy & decrease CO_2 emissions

UPGRADE / REPLACE INFRASTRUCTURES EQUIPMENTS

Enhance efficiency

SUPPLY WITH GREENER ENERGY

On-site / off-site

LEVERAGE BIG DATA

Support continuous improvement

FINANCE

Deliver cost effectively

Our Ambition