Scottish Engineering

Route map to net zero

Securing a Green Recovery on a Path to Net Zero

House keeping

> Please place your microphone on mute and camera off

> Webinars will be recorded

> Slides will be made available

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SOLAR ADVISORY SERVICE

Scottish Engineering

More power to you

We provide clean energy solutions to decarbonise real estate and materially reduce energy costs

www.solaradvisoryservice.co.uk

Contents


Solar PV
Example Project
Finance Options
What If I Need A New Roof?
Summary

Why Solar PV?

Driven by demand for clean low-cost energy, Solar PV will be the largest global power generation technology, as early as 2035.

- Solar PV Will Reduce Your CO2 Emissions
- Solar PV Will Slash Your Energy Bills: Cost-effective Power Generation
- Energy Independence: A Reliable and Resilient Power Source
- Boost Your Property Value: An Investment for the Future

Solar Panels – Efficiency Improvements

Solar panel efficiency is a measurement of how much of the sun's energy a certain panel can convert into usable electricity. This is done by capturing the electrical current generated when sunshine interacts with silicon or thin film cells inside the solar panel.

It's measured fairly simply. If a solar panel has 20 percent efficiency, that means it's capable of converting 20 percent of the sunshine hitting it into electricity. The highest efficiency of solar panels can reach 23 percent efficiency, very new and more expensive tech is now showing some panels achieving 26%.

First generation solar panels were around 6% efficient, so much as 23% efficiency does not sound high on the face of it, panels today are 4x more efficient than they were in the past.

Solar Cell Type	Efficiency Rate	Advantages	Disadvantages
Monocrystalline Solar Panels (Mono-SI)	~20%	High efficiency rate; optimised for commercial use; high life-time value	Expensive
Polycrystalline Solar Panels (p-Si)	~15%	Lower price	Sensitive to high temperatures; lower lifespan & slightly less space efficiency
Thin-Film: Amorphous Silicon Solar Panels (A-SI)	~7-10%	Relatively low costs; easy to produce & flexible	shorter warranties & lifespan
Concentrated PV Cell (CVP)	~41%	Very high performance & efficiency rate	Solar tracker & cooling system needed (to reach high efficiency rate)

Solar PV

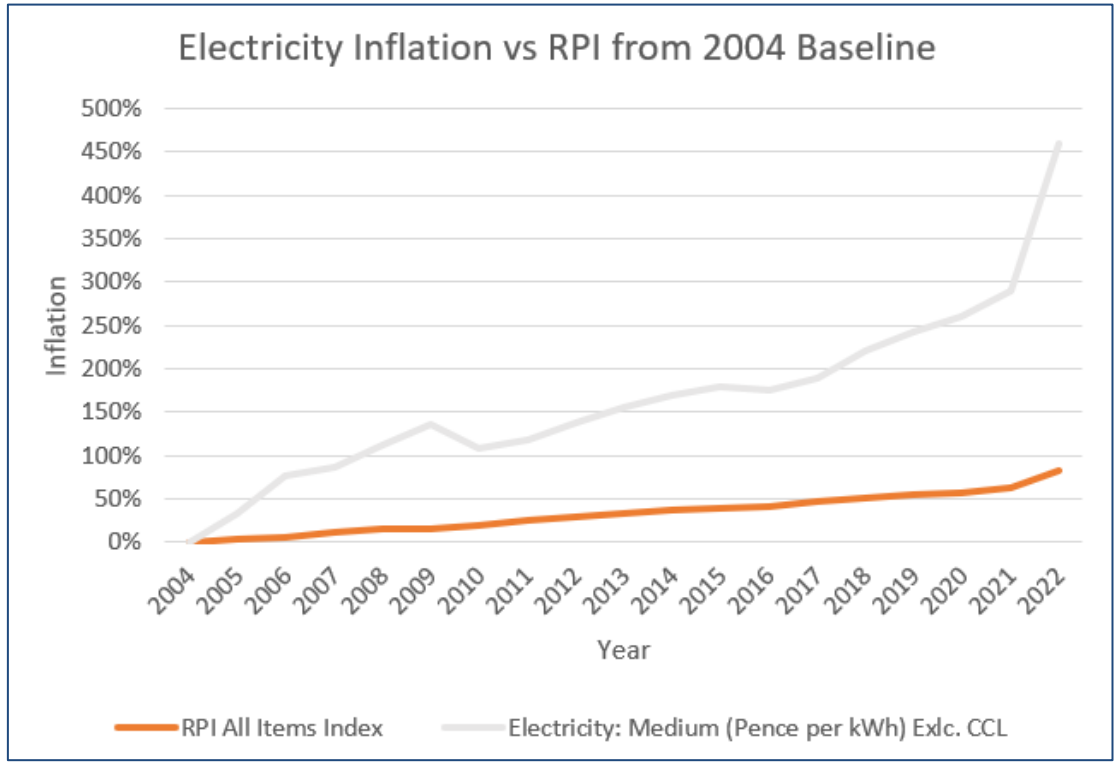
- 25 year performance 90% efficiency remaining, 30 year reference service life
- Designs are based on 20 year historical weather data from your postcode
- Energy data should be taken from your supplier provided Half Hourly (HH) data
- Designs are done with industry standard PV Sol Premium 2024 software, or equal
- We design with worst case scenarios in terms of system performance

We will install market leading, accredited sustainable products, maximising output and life span/durability

Energy Cost vs Inflation

- Prices are impacted by situations like the Ukraine War, Israel conflict, increased demand on electricity in the UK and higher labour costs.

- Ofgem have announced a 10% increase from October 2024. The rise in the price cap is the result of higher prices on the international energy market, Ofgem said, owing to increasing geopolitical tensions and extreme weather driving competition and demand for gas, which determines the price of wholesale electricity.



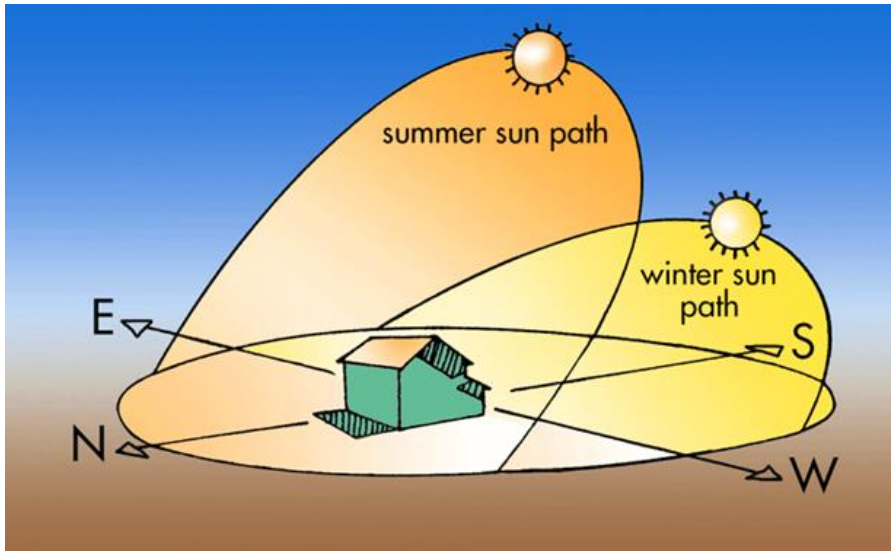
Electricity - https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector

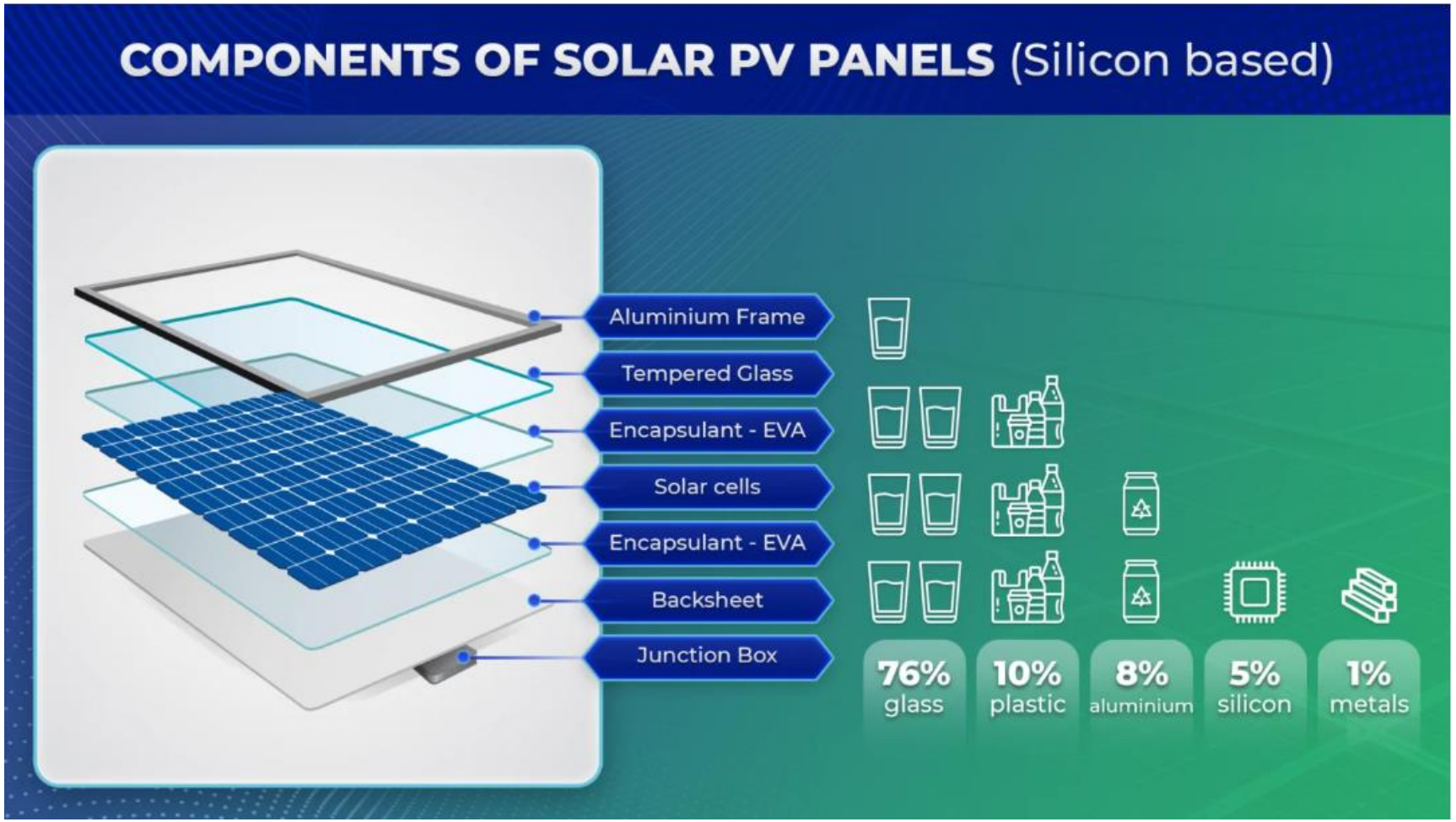
Inflation - https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceindices

Solar panels work best in direct sunlight, they can also work on cloudy days and in partial shade. PV panels use particles of light - photons, to generate electricity. Photons are present in direct and indirect sunlight, so solar panels can operate in both conditions.

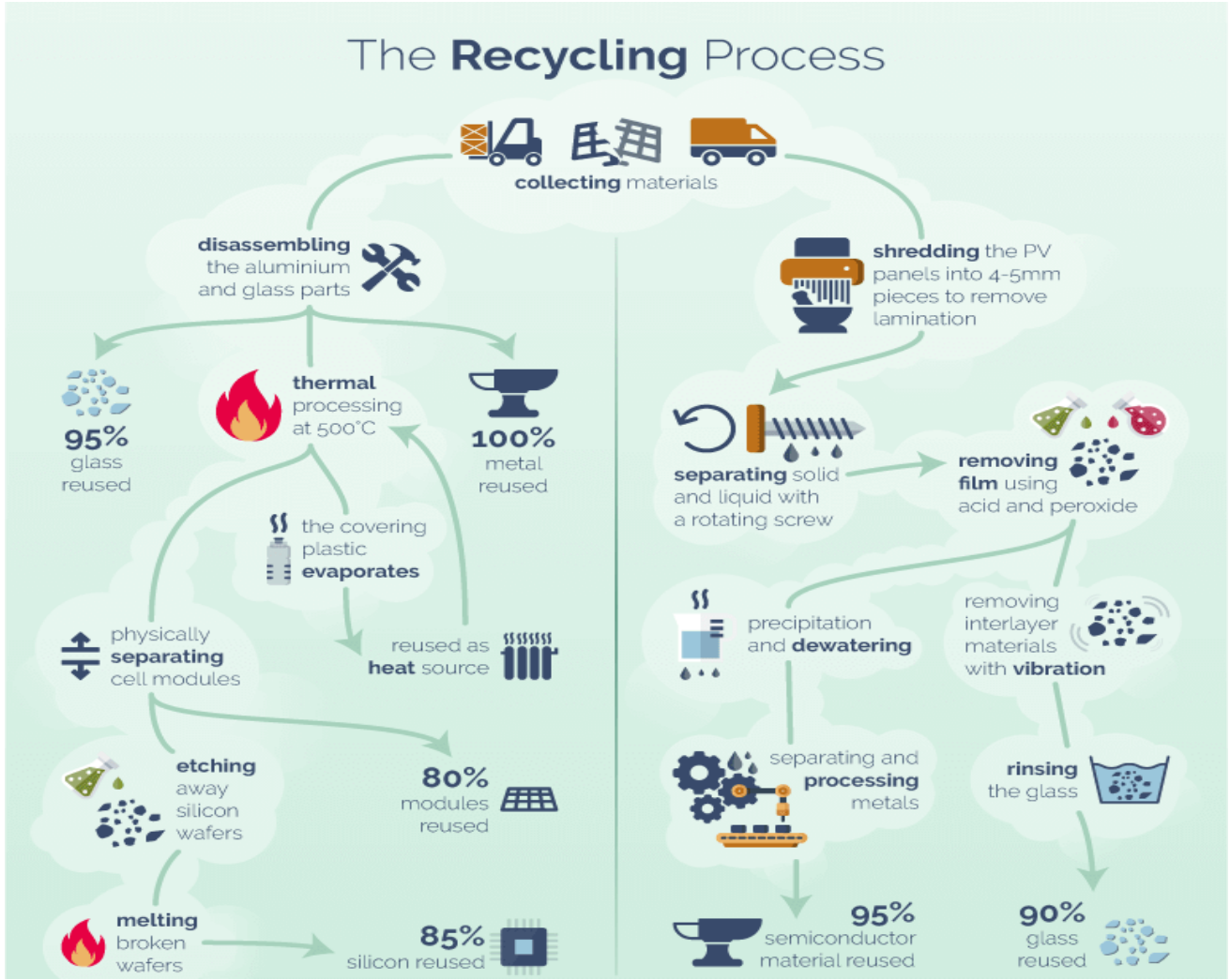
Shade

Sunlight and shade levels can vary significantly throughout the day. If the panels are shaded in the morning, for example, they may receive ample sunlight in the afternoon, allowing for sufficient electricity production as the sun travels around its path.




COMPONENTS OF SOLAR PV PANELS (Silicon based)
Aluminium Frame
Tempered Glass
Encapsulant - EVA
Solar cells
Encapsulant - EVA
Backsheet
Junction Box
76% glass
10% plastic
8% aluminium
5% silicon
1% metals

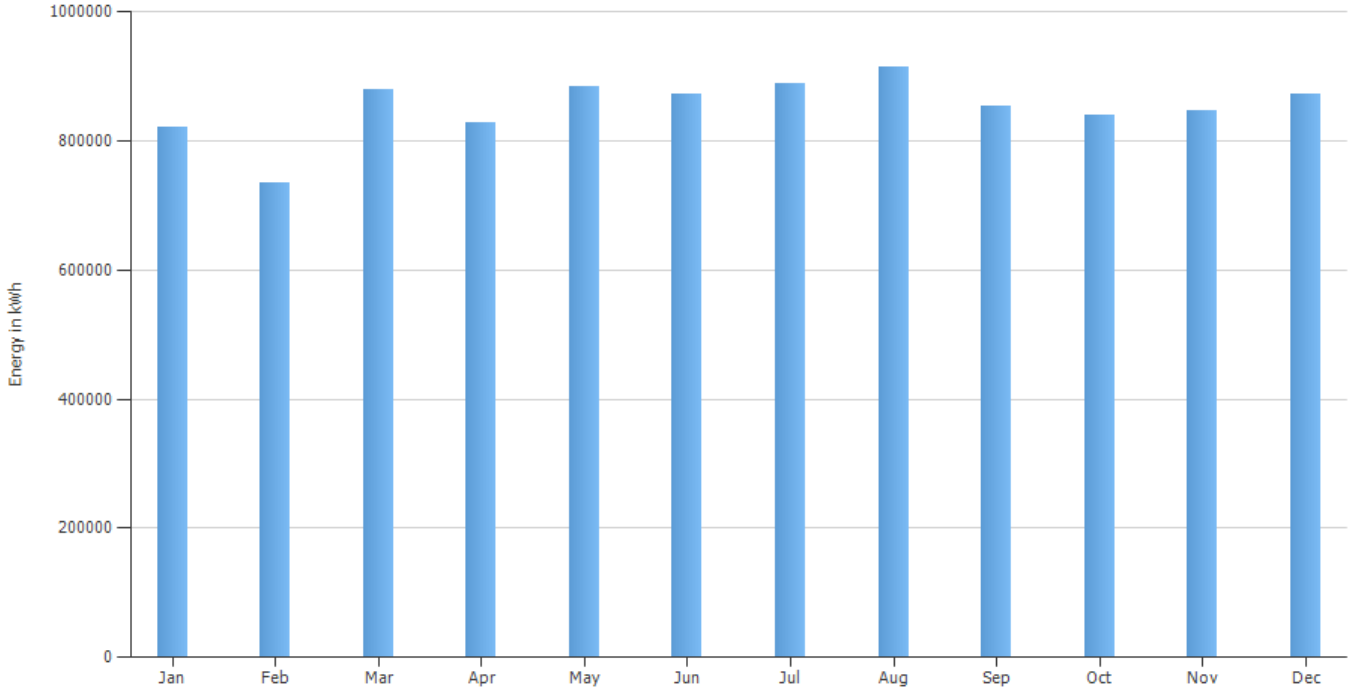
Solar PV - Recycling Process



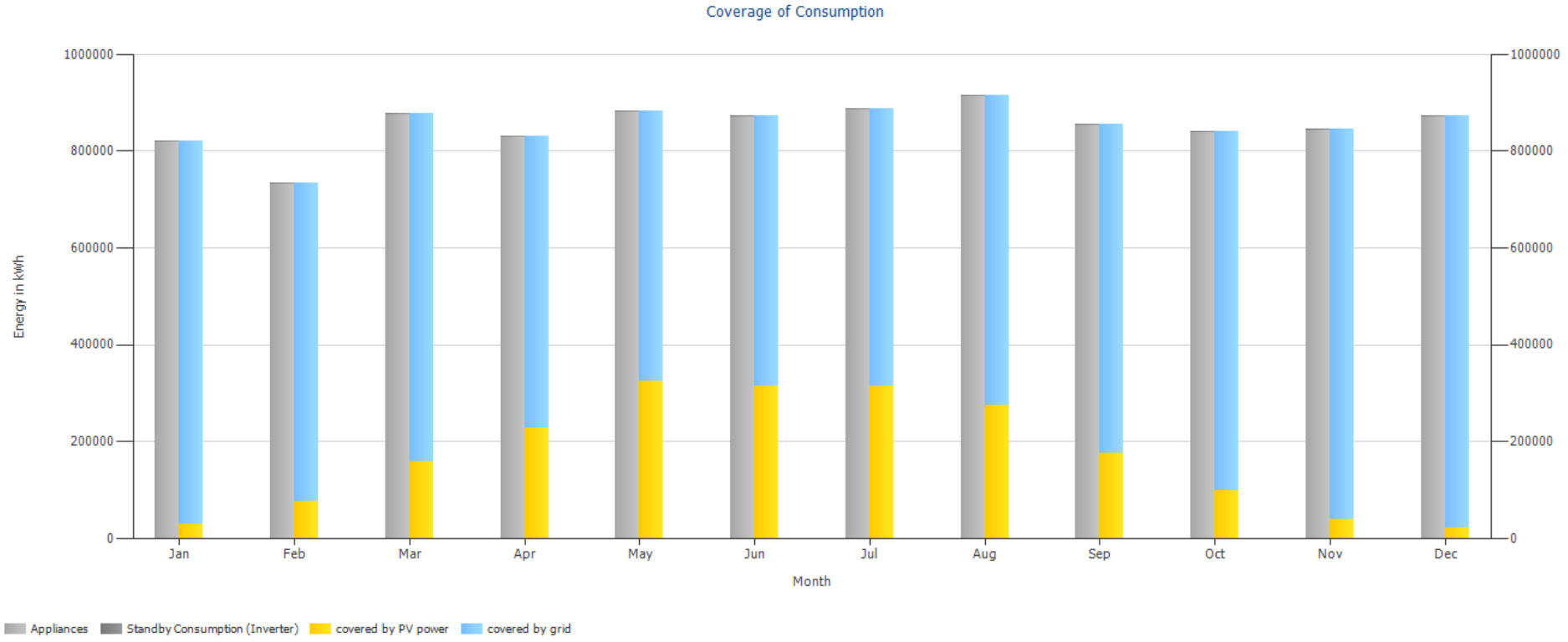
PV System size - 2,772kWp

Example Project

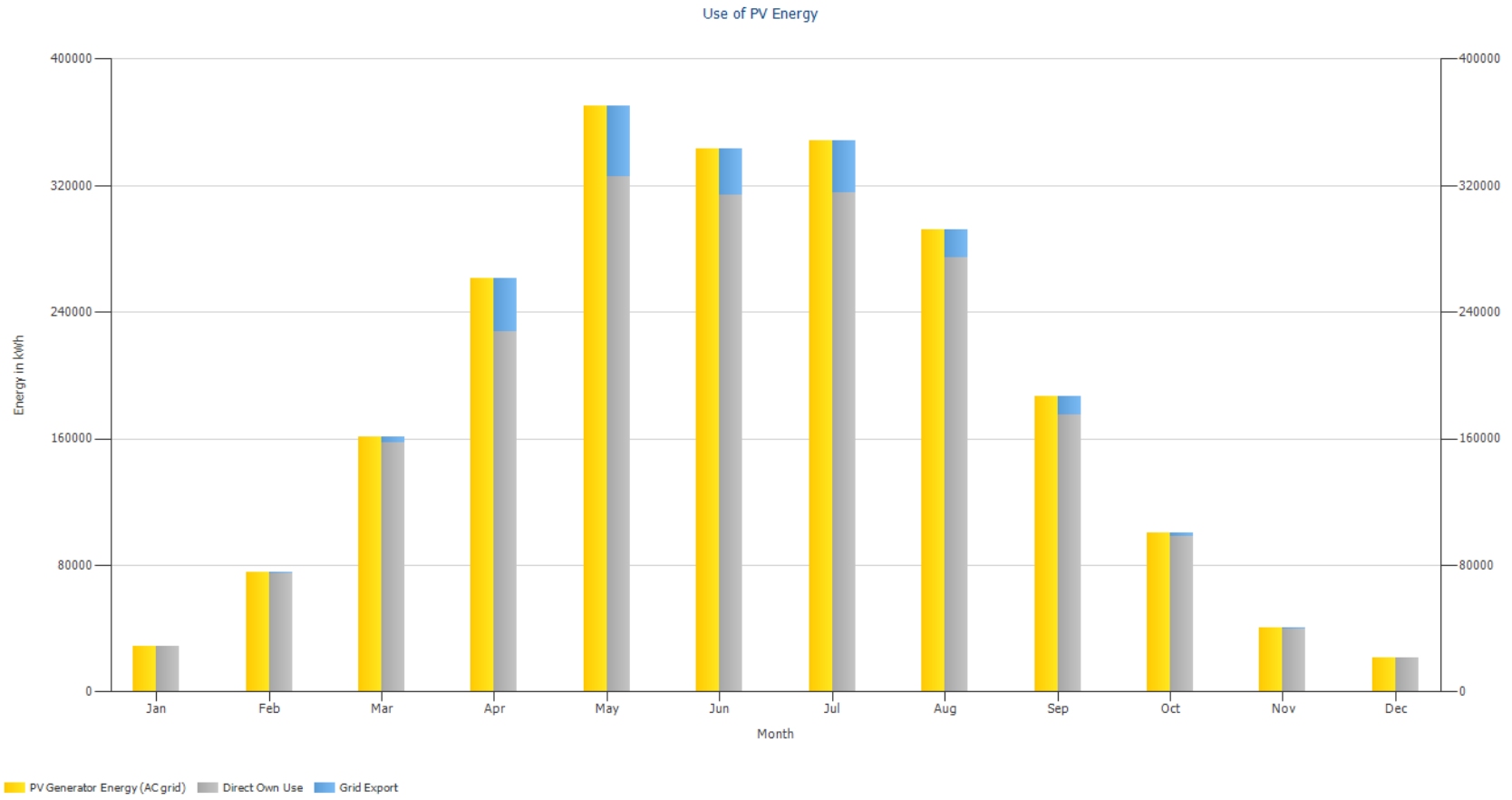
- Bundled Grid Rate - 21.5p/kWh
- Consumption 2023 - 10,237,753kWh
- Annual Electricity Spend - £2.2M



Example Project – Consumption Coverage – 19.2%



Example Project – Use Of PV Energy

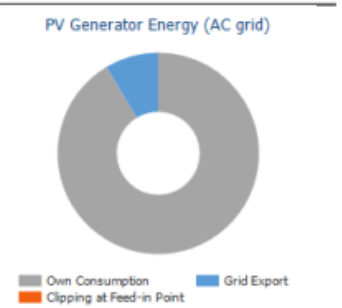


Simulation Results

Results Total System

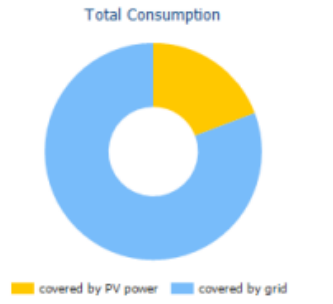
PV System

PV Generator Output	2,772.00	kWp
Spec. Annual Yield	776.51	kWh/kWp
Performance Ratio (PR)	89.67	%
Yield Reduction due to Shading	1.5	%
PV Generator Energy (AC grid)	2,153,018	kWh/Year
Own Consumption	1,967,750	kWh/Year
Clipping at Feed-in Point	0	kWh/Year
Grid Export	185,268	kWh/Year
Own Power Consumption	91.4	%
CO_2 Emissions avoided	1,011,670	kg / year



Appliances

Appliances	10,237,753	kWh/Year
Standby Consumption (Inverter)	529	kWh/Year
Total Consumption	10,238,282	kWh/Year
covered by PV power	1,967,750	kWh/Year
covered by grid	8,270,532	kWh/Year
Solar Fraction	19.2	%



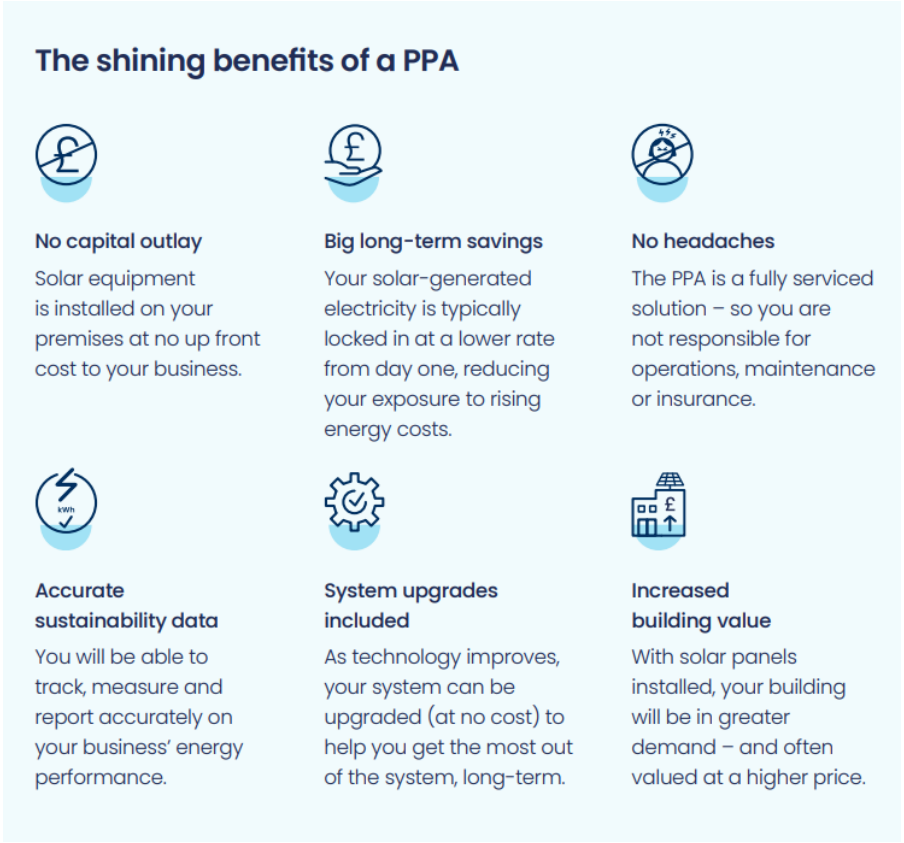
Level of Self-sufficiency

Total Consumption	10,238,282	kWh/Year
covered by grid	8,270,532	kWh/Year
Level of Self-sufficiency	19.2	%

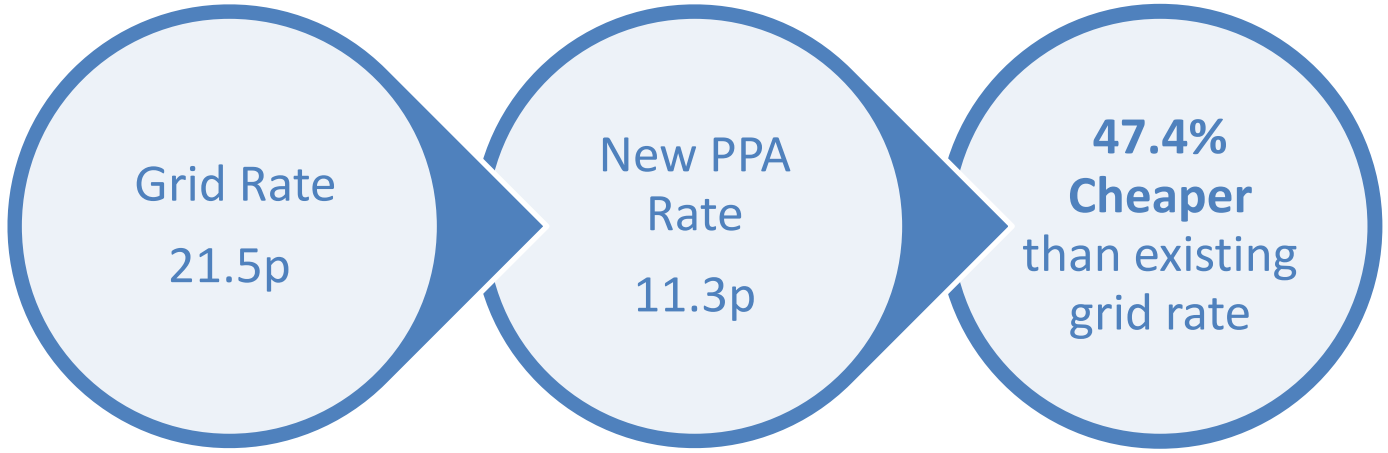
Power Purchase Agreement (PPA)

Solar PPA Explained

- An onsite solar PPA is a long-term electricity supply agreement that enables you to install a solar system on site – without the capital outlay.
- Solar Advisory Service operates and maintains the system and sells you the electricity it generates at an agreed rate (p/kWh)
- This rate is typically significantly lower than what you would pay for grid-sourced energy.
- Ideal for companies operating during daylight hours, PPAs are typically in place for 7-30 years.



Example Project - Savings



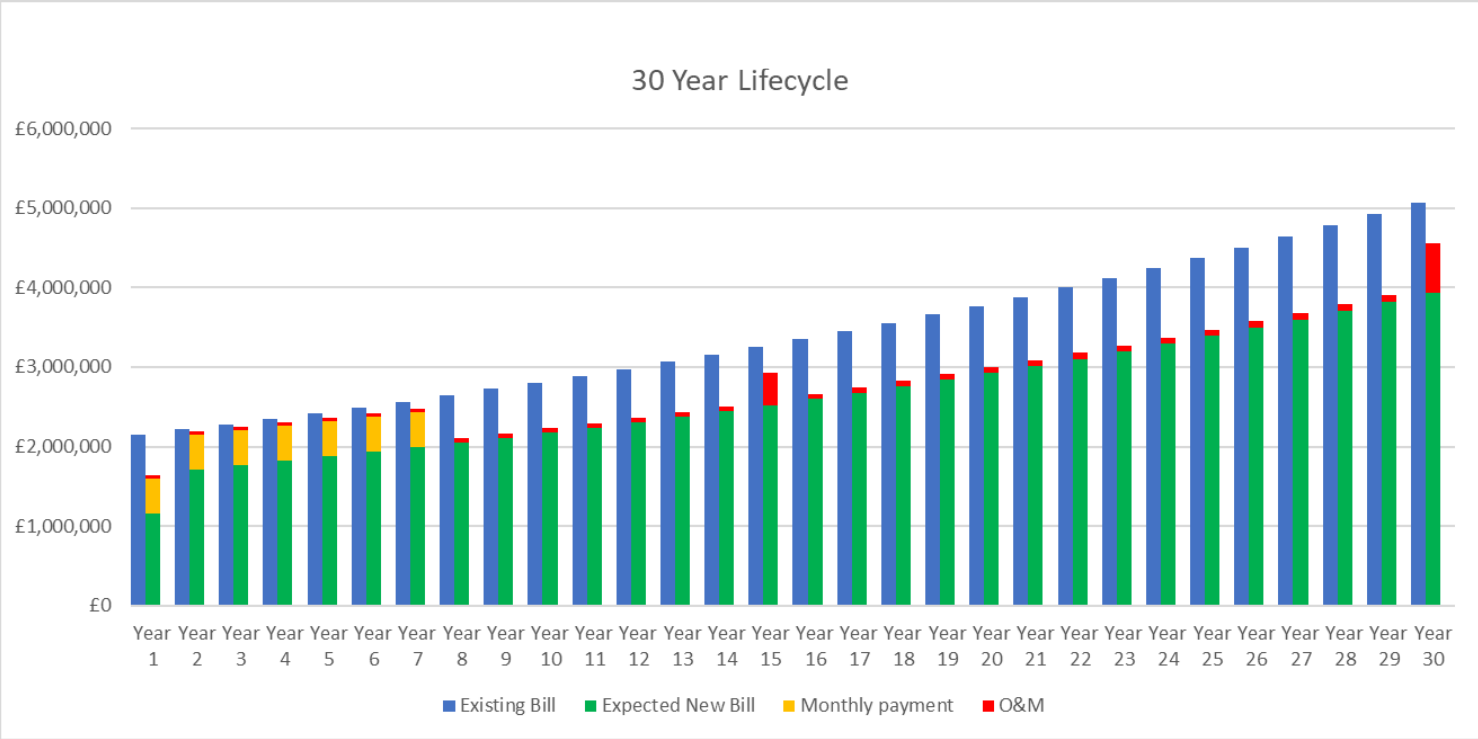
Over the course of the PPA contract:

- They will replace 19.2% of their energy with solar
- Offset 31,410 tonnes of CO_2 – *equivalent to 1,444,860 trees being planted*
- Save an estimated £8,666,940

Other Finance Options – Hire Purchase

The installation qualifies for Annual Investment Allowance (AIA) and 25% of the Capital Cost has been deducted from year 1 in the illustration.

Operation and Maintenance (O&M) costs have been included, along with expected costs for Inverter replacements at year 10 along with system disposal costs at year 30 allowing you a full understanding of costs and savings over the systems lifecycle.



Benefits

- 7 Year Hire Purchase Agreement
- Cash positive in the 1st year
- £13.2m saved over the term
- 31,410 Tons of CO_2 saved

Permissions Required Prior to Installation

Planning Permission n/a = Permitted Development
Building Warrant if works are required to roof structure

Scottish Power Energy Networks - SPEN

G98 – Less than 16amps (3.68kW)
G99 – More than 16amps (3.68kW)
G100 – No Export Permitted

Smart Export Guarantee

If you generate renewable electricity in your home or business, you can feed back into the grid any electricity that you don’t use. Under the Smart Export Guarantee (SEG) you will be paid for every unit of electricity that you feed back.

Rates depending on provider 10-15p kWh

Mandatory SEG Licensees

- British Gas Trading Ltd
- E (Gas and Electricity) Ltd
- E.ON Next Energy Ltd
- EDF Energy Customers Ltd
- Electricity Plus Supply Ltd (trading as Utility Warehouse)
- Octopus Energy Ltd (trading as Octopus)
- Octopus Energy Operations Ltd (trading as Octopus)
- Octopus Energy Operations 2 Ltd (trading as Octopus and Shell)
- OVO Electricity Ltd
- Scottish Power Energy Retail Ltd
- SO Energy Trading Ltd
- Utilita Energy Ltd

Annual Investment Allowance

If you buy an asset that qualifies for 100% first-year allowances you can deduct the full cost from your profits before tax.

You can deduct the full value of an item that qualifies for annual investment allowance (AIA) from your profits before tax.

If you buy something, (in this case Solar PV) under a hire purchase contract you can claim for the payments you have not yet made when you start using the item. You cannot claim on the interest payments or charges.

Energy Storage

Battery storage, or battery energy storage systems (BESS), are devices that enable energy from renewables, like solar and wind, to be stored and then released when the power is needed most. The BESS can be charged by solar and / or from grid when cheapest, then used on site and / or exported to grid at peak time at preferential rates.

Lithium-ion batteries, which are used in mobile phones and electric cars, are currently the dominant storage technology.

Intelligent battery software uses algorithms to coordinate energy production and computerised control systems are used to decide when to store energy or to release it to the grid. Energy is released from the battery storage system during times of peak demand, keeping costs down and electricity flowing.

What if I need a new roof?

Solar PV as discussed has a useable lifecycle of 30 years, to maximise this potential the roof mounting surface should also have a similar useable life.

The roof structure will be subject to assessment for its load bearing capability for solar PV installation, at the same time the roof covering will also be assessed.

Both the PPA and Hire Purchase models can be configured to include the cost of repair or replacement of roof covering.

Recap – Why Solar PV?

01

Reducing your Carbon footprint

Solar PV will reduce your CO2 Emissions and support your companies drive to Net Zero

02

Accelerated savings

Save up to 75% on your electrical energy costs and increase resilience against market factors

03

Full turnkey solution

SAS Onsite Energy provide a full turnkey solution to provide green sustainable energy to your asset

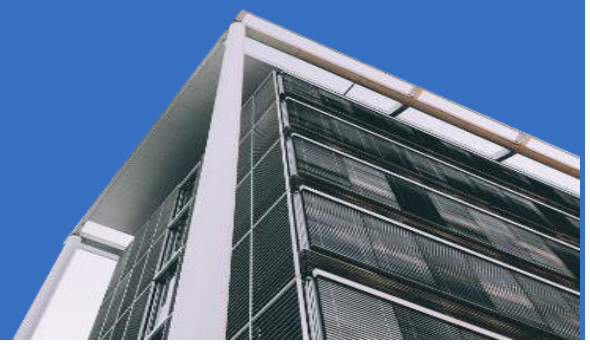
04

Working capital solution

Our solution is 100% CapEx FREE via a PPA

Or

Cash positive using a 7 year Hire Purchase agreement



Thank You

Contact: mark@solaradvisoryservice.co.uk

Agenda

Support series: Why, What and When of Net Zero

- Update on the Why of Net Zero (stakeholders)
  - Consumers
  - Customers
  - Employees
  - Competitors
  - Organisations
  - Governments
- Update on the What of Net Zero
  - Design thinking
  - Ideation
- Update on the When of Net Zero
  - Origin
  - Standards
  - Pledges

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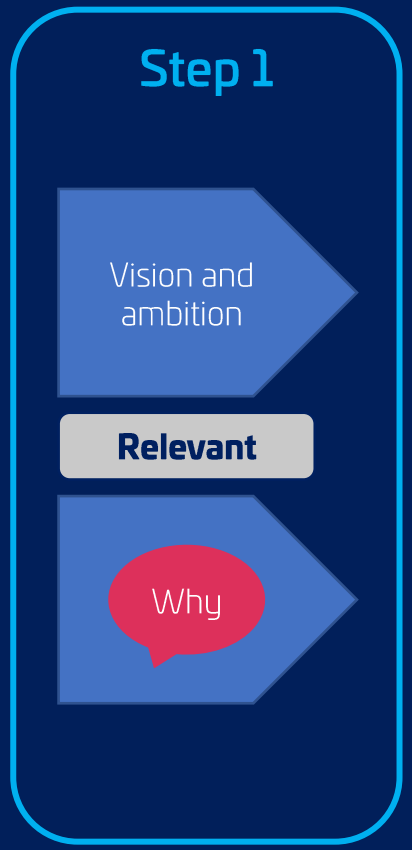
Roadmap

Why: Define the purpose



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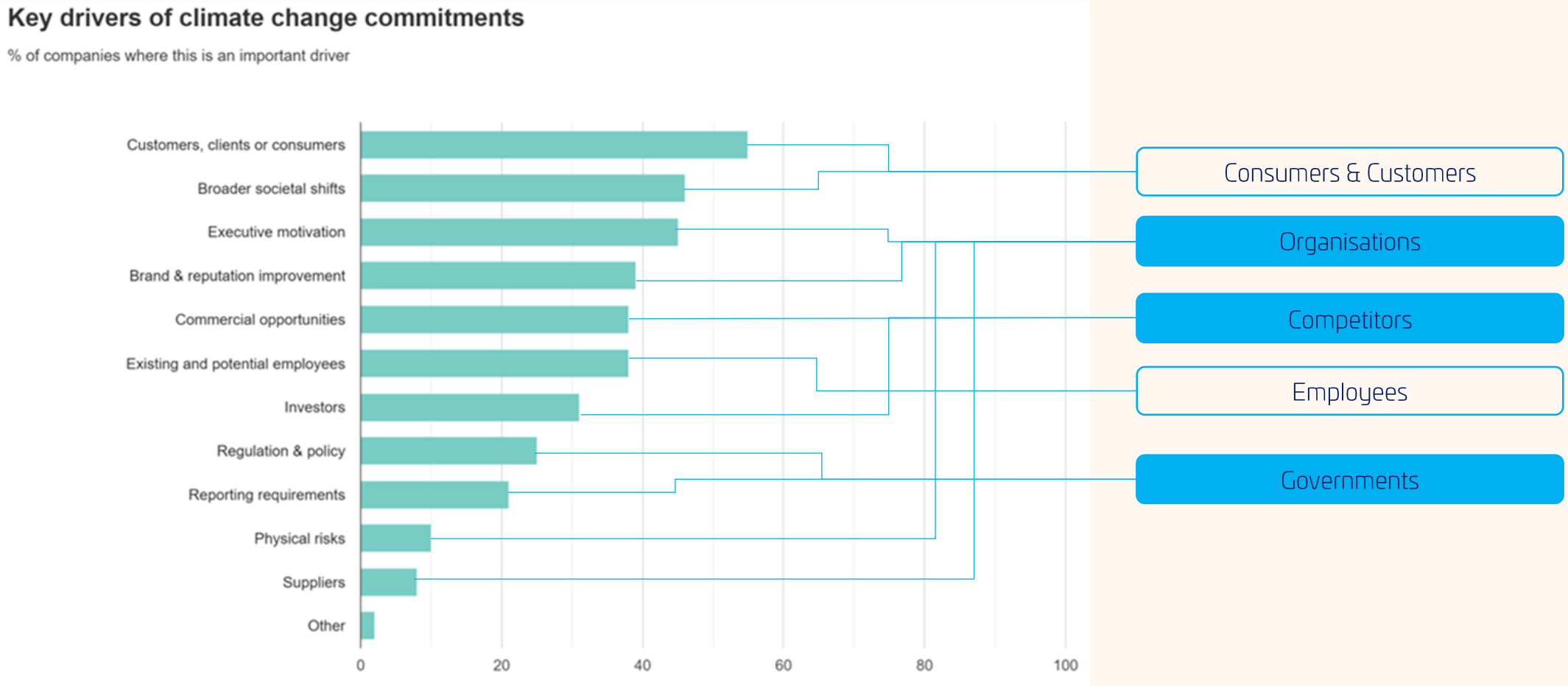
Who cares

Stakeholder desire



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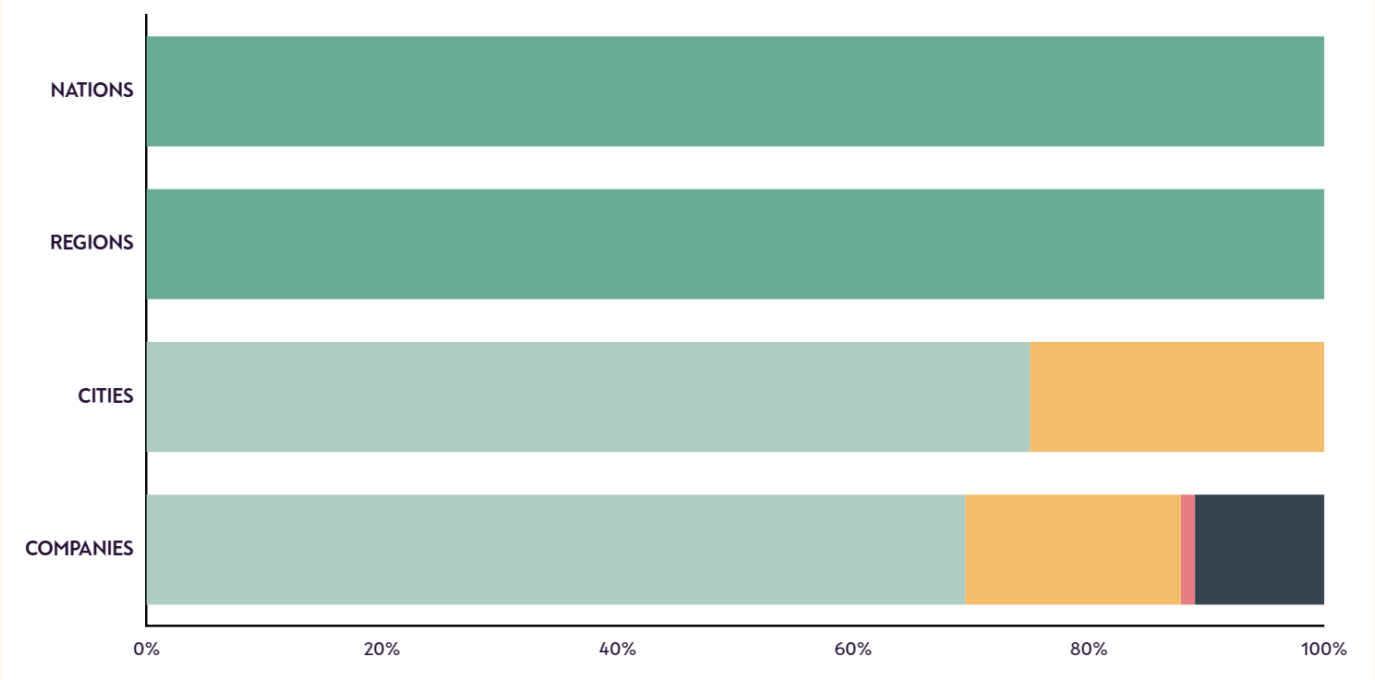
Stakeholders

From ambition to commitment in the UK

- Nation: **UK** to be Net Zero **by 2050** in law
- All UK regions to be Net Zero in law, including **Scotland by 2045**
- **75% of UK cities** plan to be Net Zero, including Glasgow (2030) and Edinburgh (2030)
- **70% of UK companies** have Net Zero included in their strategy, whilst 11% have no target



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Why

Organisation - differentiation

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Companies

Drivers for SMEs

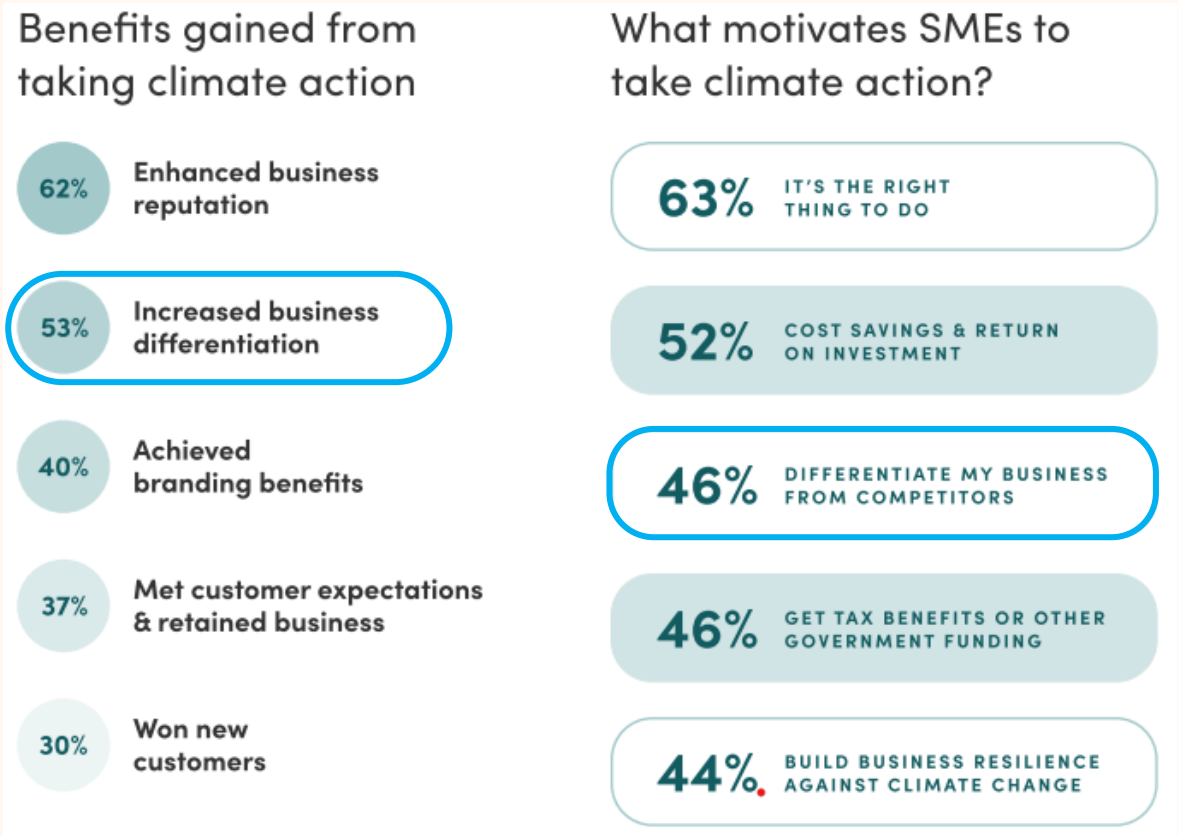
- **37%** of surveyed SMEs **met requirements from buyers by taking climate action**.

But

- **63%** of respondents have **not been asked** by stakeholders to reduce emissions.
- **Only 17%** have been asked by corporate customers to reduce emissions

Yet

- **30%** have updated their **procurement policy**
- **41%** have engaged their **suppliers** (upstream)
- **42%** have engaged **customers** (downstream)



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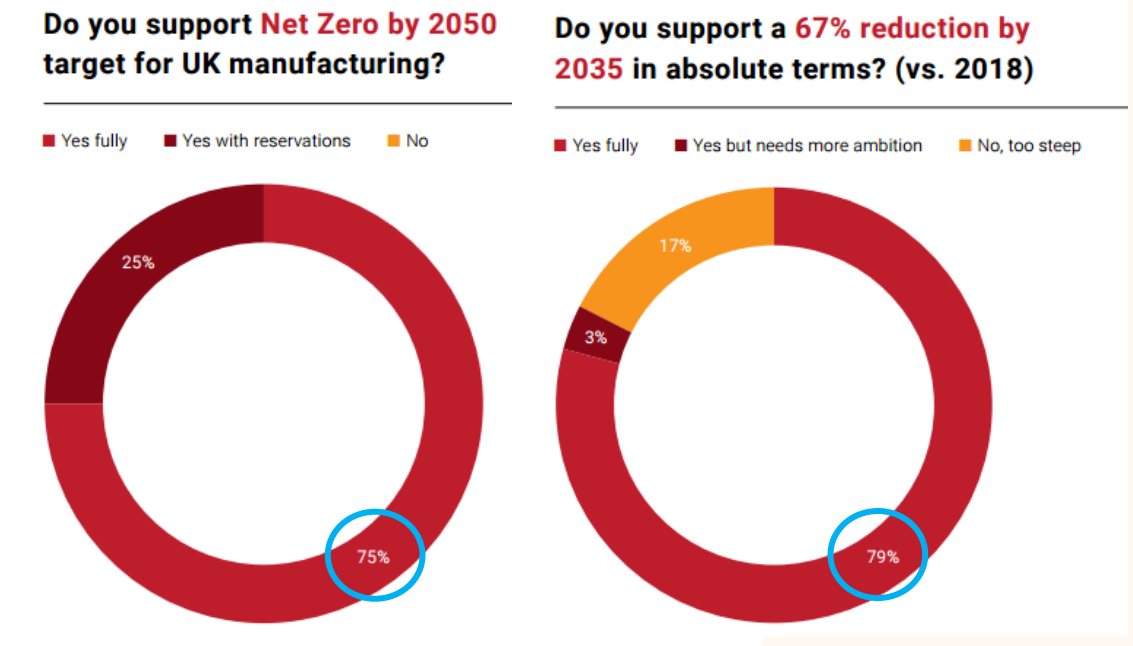
Companies

The right thing to do



- **75%** more likely to attribute great improvement in **revenue** to their **sustainability** efforts
- **56%** more likely to **outperform** their peers on **talent attraction**
- **52%** more likely to **outperform** their peers on **profitability**

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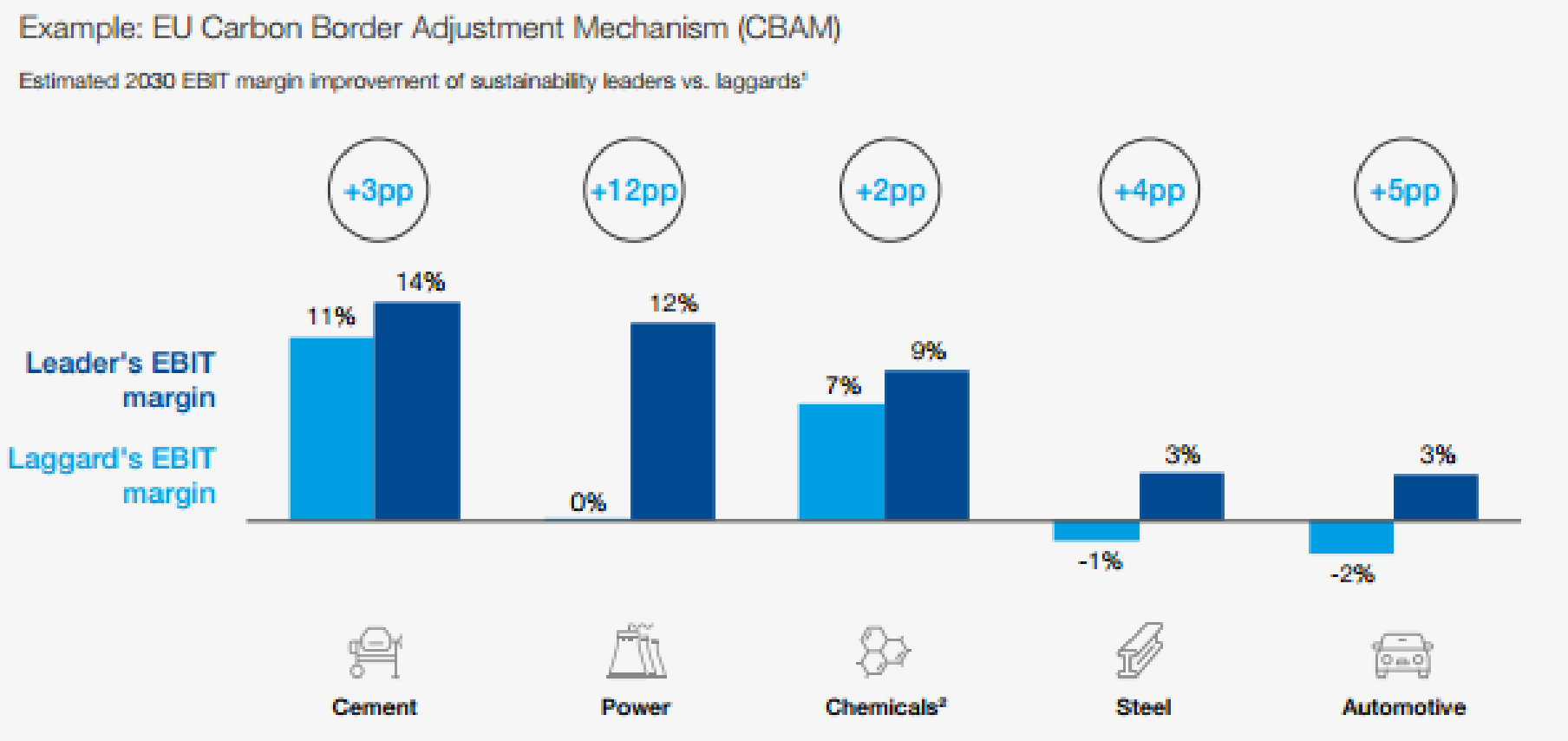
Companies

Regulations, e.g. EU CBAM

- The cost of carbon will erode margins in all energy intensive sectors by 2030
- Leaders will enjoy EBIT margins 2 to 12% higher than laggards.



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Why

Competitor - financing

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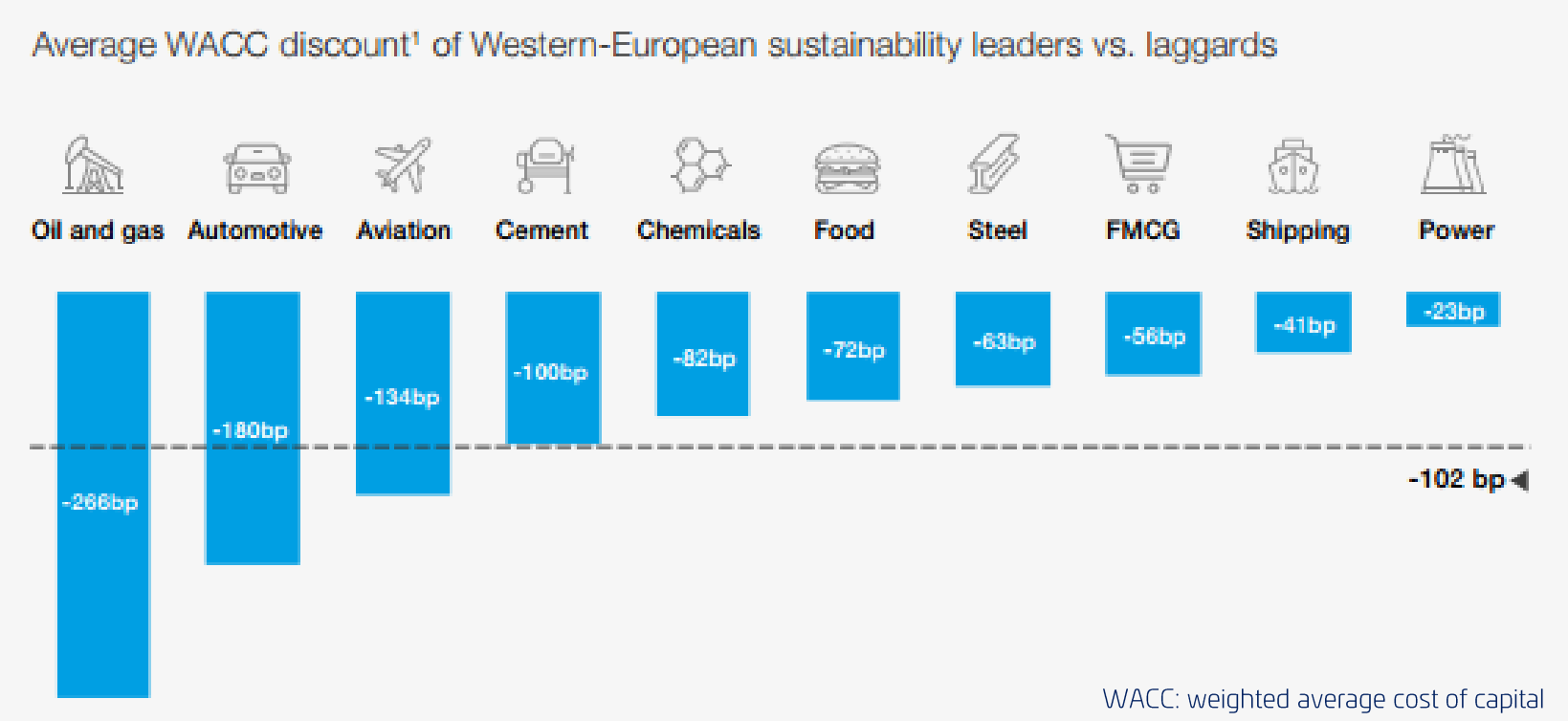
Competitors

Leaders reinforce their access to cheaper capital (~-1%)

- Climate action = lower interest rates.
- Weighted average cost of capital: lower-cost financing when tied to the achievement of sustainability targets



WACC: weighted average cost of capital

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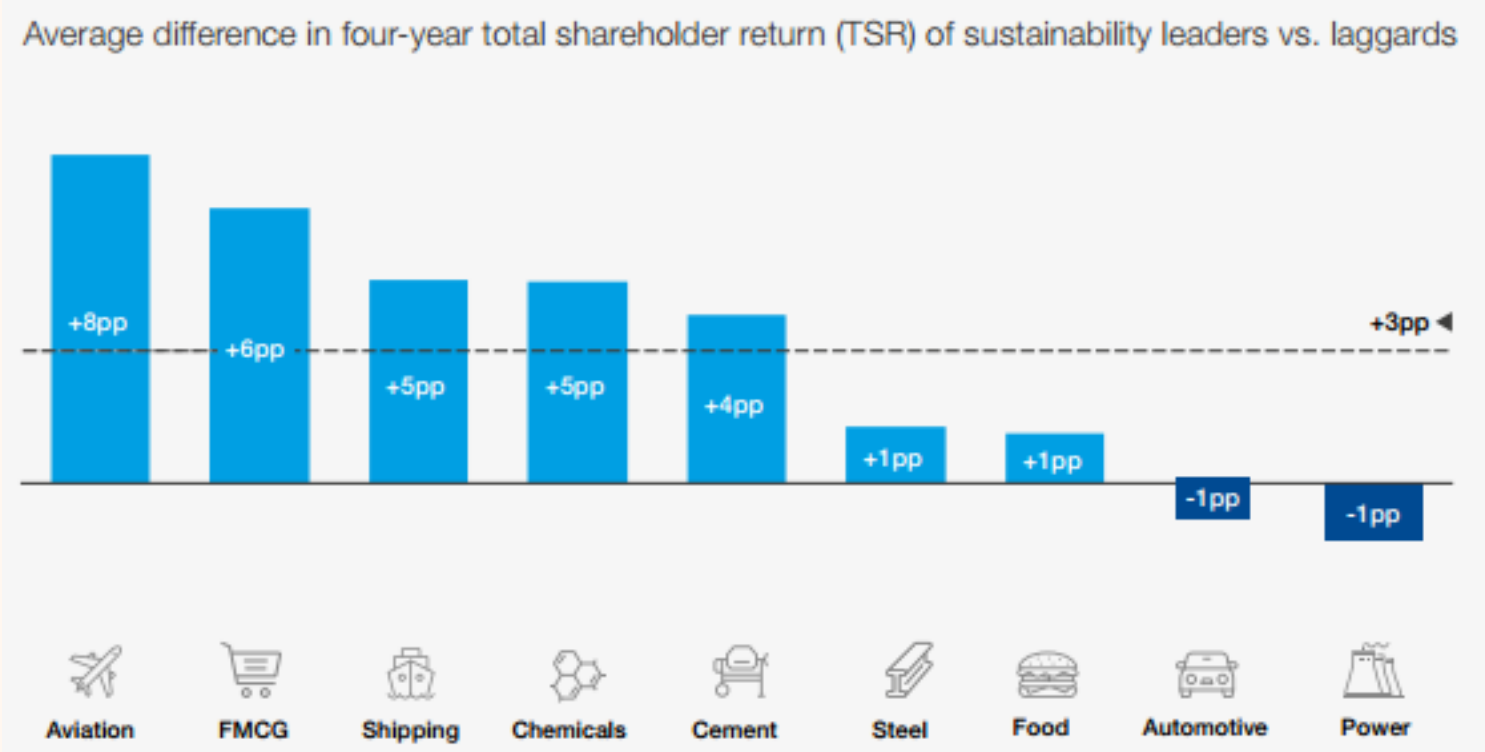
Competitors

Leaders achieve better shareholder returns (~ 3%)

- **54% of investors** agree that the **return** from leaders will be **higher** over the next 5 years, only 11% disagree.



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Competitors

Net zero deal numbers outperforming the wider equity market

Financing	Yet
• **12%** equity deals are net zero-related deals (5% in 2018)	• **22%** of companies are not on track to meet their Scope 1 and 2 decarbonization targets • **34%** are lagging their upstream Scope 3 goals
• **184%** rise in investment value of net zero-related deals	• **60%** of companies that set an upstream Scope 3 target do not have a strategy
• **Greater share of net zero-related deal count** from low-carbon businesses in Scotland and South East of England	• **64%** success rate for those seeking loans, sharply falling from 80% year on year

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Why

Government - revenue

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Taxing

Institute for Fiscal Studies and LSE recommendations

- **Extend the ETS** - there is scope to extend the ETS beyond the 29% of emissions it currently covers, even if it never covers all emissions

- **UK CBAM** - The government should bring in a border tax on emissions embedded in import

- **Carbon tax needs to be raised** - carbon tax would start at £50 per tonne of carbon dioxide.

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Reporting

Measuring and managing small and medium enterprises' GHG emissions

- **UK SMEs** (5.5 million) account for **99% of businesses** and around **50% of total UK GHG emissions**.
- **UK government** is working to **automate SME sustainability reporting** on a national scale.
- **Bankers for Net Zero** is working to help their SME customers to **track GHG emissions** (Perseus) to unlock further **access to capital** and help achieve net zero goals.

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Step 1: vision

Why > Because if you do not, someone else will ⇨ competitors

Why > Because it differentiates ⇨ organisation

Why > Because it is a source of revenue ⇨ government

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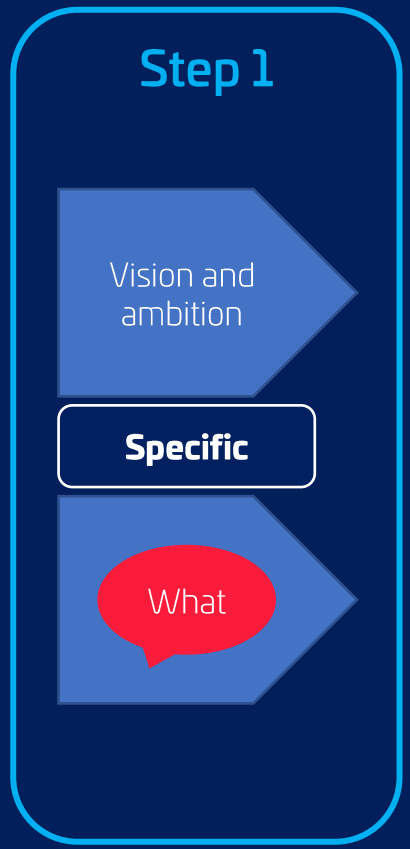
Roadmap

What: Define the task



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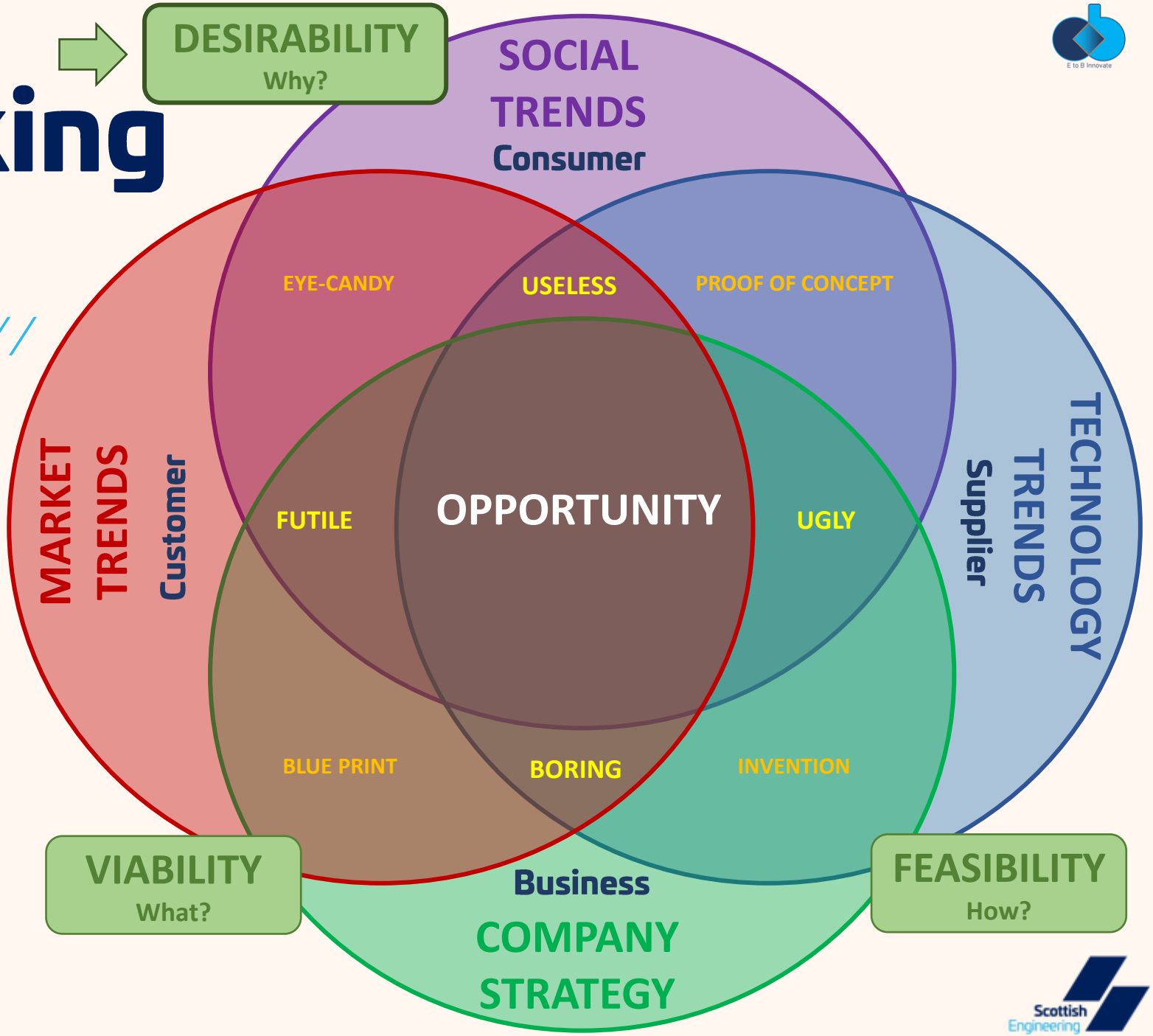
Design thinking

User-centered

- Desirability – social and market trends (why it should be done)
- Feasibility – technologies and strategy (how it can be done)
- Viability – market and strategy (what can be done)



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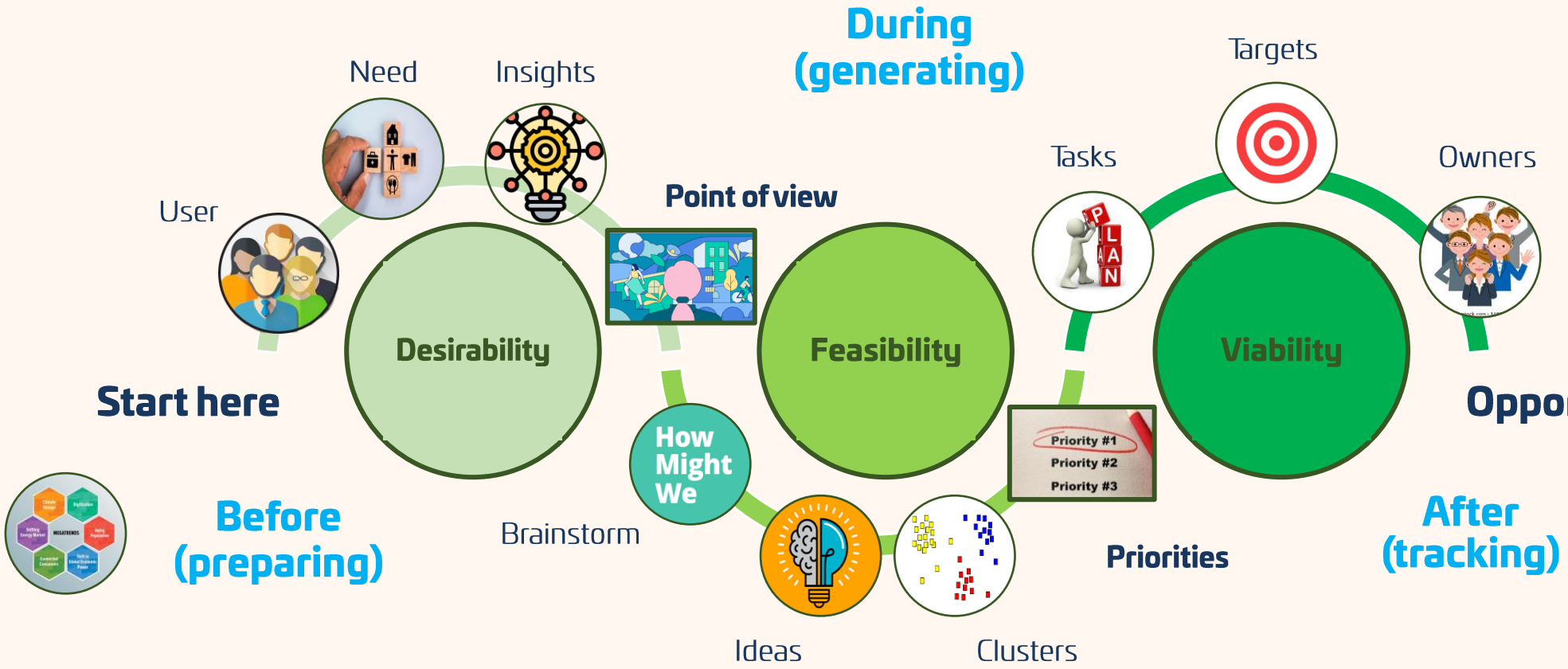
Ideation

Brainstorming



User, Needs and Insights

Advancing Offshore Wind

Power generation, distribution and storage

- J. Decarbonised **steel & cement**
- E. More reliable turbines with lower **maintenance** costs
- H. Long range power **networks** (e.g. links to Norway and Iceland)
- D. Long lifetimes with end of life **recycling** designed in
- F. Local **H2 and ammonia** production
- C. Improved **generator** materials (e.g magnets)
- G. Distributed power networks and battery **storage** (e.g. battery, geothermal, etc.) **interlinks**

Materials

- A. Corrosion and **biofouling** resistant materials
- B. Blade **coatings** to improve efficiency
- I. Biomaterials for **self healing** cables and foundations

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User, Needs and Insights

Green Public Transport, Cycling and Walking

Power generation

D. Materials for long life **geotechnical assets**

Power consumption

B. **Battery/hydrogen powered** high-speed **trains**

G. **Battery/hydrogen powered buses** for short journeys (cities) and long distance routes (rural areas)

C. Materials for line **electrification and signaling**

F. **Fast charging** materials and onboard charging points

Materials

A. **Lightweight** materials for chassis and carriages

E. Smart textiles and antibacterial **surfaces**

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User, Needs and Insights

Shift to Zero Emission Vehicles

Indirect upstream emissions

C. Decarbonisation of UK **steel and glass making**

F. Materials for new **braking systems** for electric vehicles, and more environmentally friendly brake pads

I. New sustainable **lubricants** in electric vehicles

J. Developments in **battery technology** to increase range and charging

B. Sustainable bio-polymers and novel **textile materials** for interiors

Direct emissions

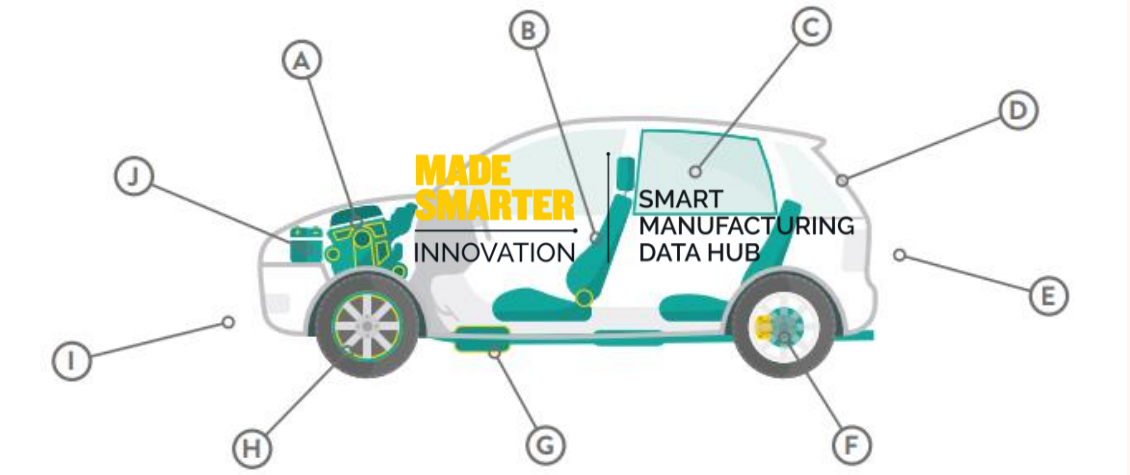
A. New materials for greener engines and **advanced manufacturing** processes

Indirect downstream emissions

D. New materials to enhance **light-weighting** without compromising safety

H. New materials for wheels to **reduce particulate emissions** and microplastic release into the environment

E. Circular economy and **recycling** of components built into vehicle designs



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Step 1: ambitions

What > Priorities: governments' ambitions

What > Innovation: from ambition to solution

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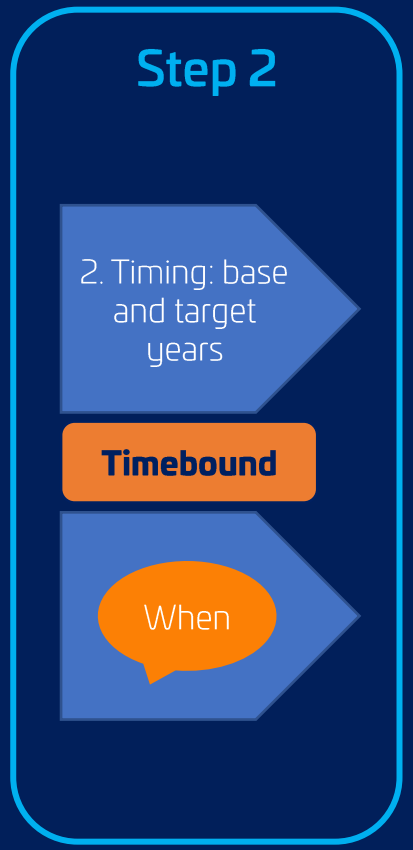
Roadmap

When:
Define the timing



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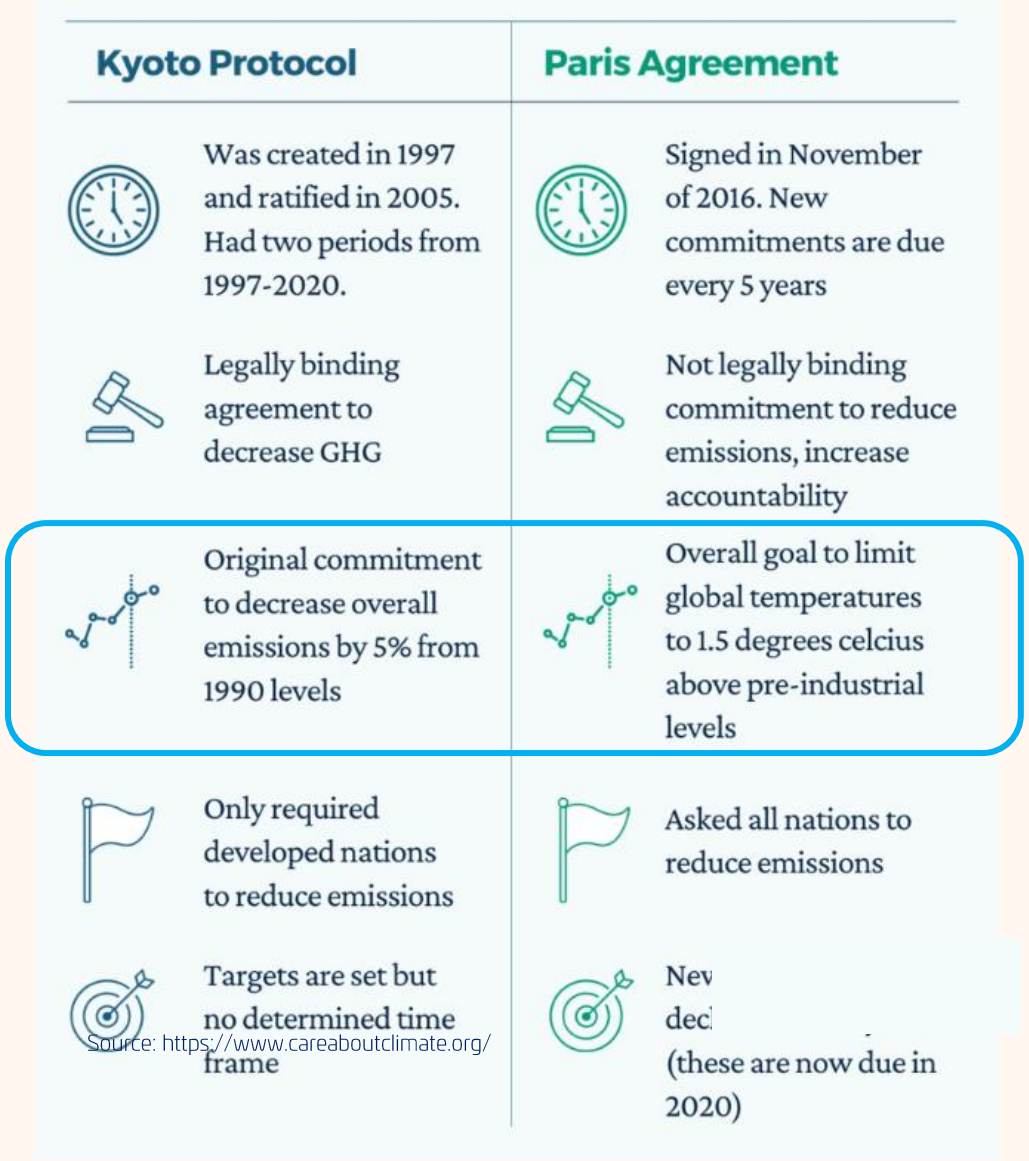
From Kyoto to Paris

Base year | Target year

- Base year used by most government's roadmap is based on Kyoto protocol: **1990**
- Ambitions used by most standards is based on Paris agreement: 1.5°C which means Net Zero by **2050**



Source: https://www.careaboutclimate.org/

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Standards

Base and target year: divergence

GHGp	• S4. Choose the target base year • Companies shall choose and report a base year for which verifiable emissions data are available and specify their reasons for choosing that particular year.. • S5. Define the target completion date
SBTi **(Net Zero Std v1.2)**	• NZ C13 – Base year: companies must set targets with a base year of 2015 or later. Near-term targets must cover a minimum of 5 years and a maximum of 10 years from the date the target is submitted to the SBTi for official validation. • NZ C16 – The company shall use the same base year for its long-term targets as its near-term targets. • NZ C17 – Target year(s): Long-term targets shall have a target year no later than 2050.
ISO14064.1 **(GHG emissions)**	In establishing the base year, the organization: a) shall quantify base-year GHG emissions and removals using data representative of the organization's current reporting boundary b) shall select a base year for which verifiable GHG emissions or removals data are available
ISO14068.1 **(carbon neutrality)**	• Content of carbon neutrality management plan: the base period and the target year by which only residual GHG emissions will remain, including the rationale for the timing • Short-term is typically 5 years to 10 years, long-term is typically at least 20 years. A common target year by which only residual GHG emissions will remain is 2050.

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Pledges

Large number of options

- From 2026 (MRS) to 2050 (Climate Hub)
- Consider:
  - Your stakeholders, your customers
  - Your resources:
    - Financial – shareholders
    - Human – employees
    - Allocation – skills

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Step 2: timing milestones

When > From when (base year) to when (target year ambition)

When > Base year: representative of the organisation as it is today

When > Target year: meet the stakeholders' needs

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Scottish Engineering programme

Support available

- Tools – roadmap, innovation
- Data – 21 webinars (https://www.scottishengineering.org.uk/net-zero-skills/path-to-net-zero-webinars/)
- Time – 323 1-to-1s, 130 organisations, 2 pilots
- Information – 10 monthly newsletters
- Skills – 2 courses (https://netzero.scoteng.org/)
- Knowledge – 475 reports (https://netzero.scoteng.org/)

- Please make a note of interest to:
  - scoteng.org.uk
  - 0141 221 3181

Eric Boinard
Net Zero Project Lead
ericboinard@scottishengineering.org.uk

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