IMPERIAL

Sustainable Imperial

Our journey to a net zero estate by 2040

Our journey to a net zero estate by 2040

Foreword

Imperial College London has a net zero by 2040 ambition, this is well publicised and is fully supported by the University Management Board.

The Property and Major Projects directorate are committed to driving and delivering the estate element of this target. Working closely with consultant ARUP over the past few years, the necessary foundations have been laid. This has included large capital projects, such as removal of steam from the South Kensington Campus, and retrofit interventions to create our first fossil fuel-free building, the Clinical Research Building at Hammersmith.

This document details our plan.

Adam Srodzinski
(Interim) Director of Property and Major Projects

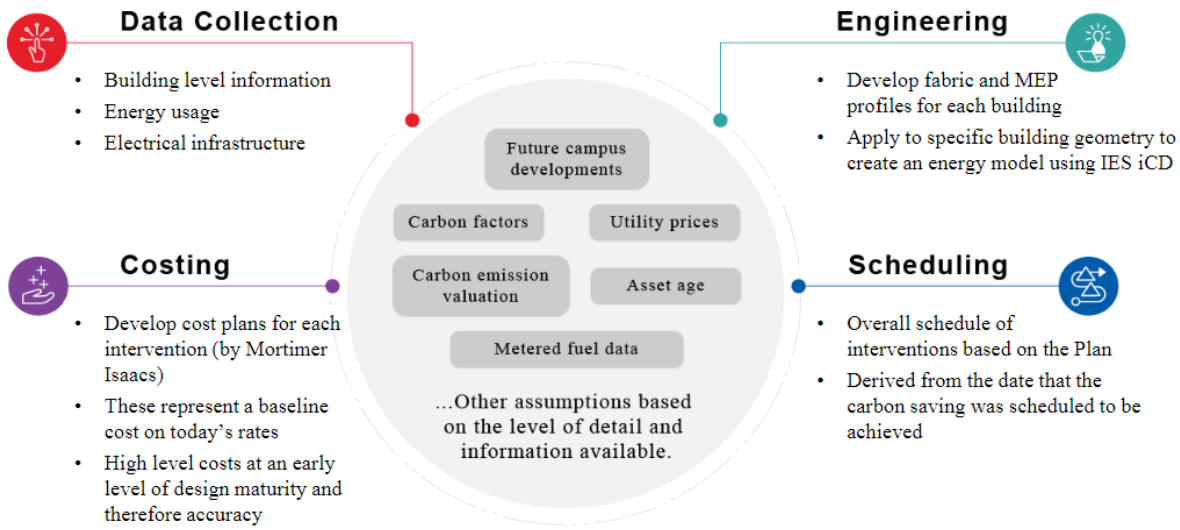
Our goal

Our goal is to create great environments in which to learn, teach, research and work that are sustainable in every sense of the word. This involves achieving net zero emissions by 2040.

Where we are

Consultants ARUP have been working with the Property and Major Projects team to develop a programme and identify associated costs to decarbonise our estate to achieve our ambition. This complex study was developed in three stages that focused on data collection and review; modelling and testing; and the development of the decarbonisation plan. An overview is provided in Figure 1.

Figure 1: Developing the Carbon Management Plan



Source: Imperial College London Decarbonisation Plan, ARUP 2023

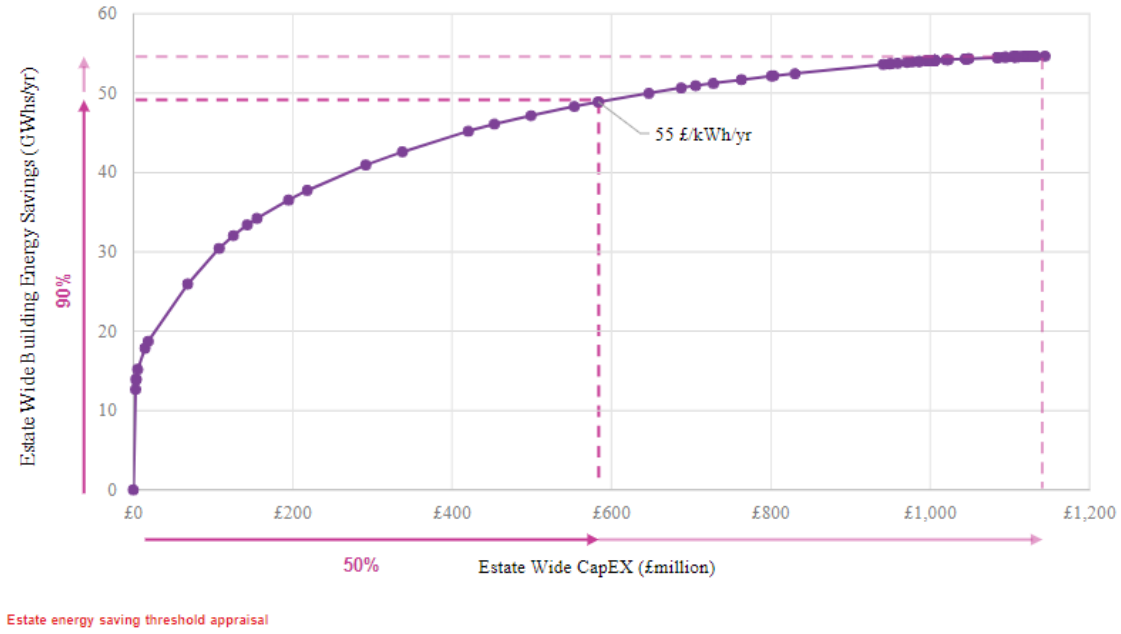
This outline plan has been scrutinised and signed off by Imperial's Sustainability Expert Group, Sustainability Strategy Committee and University Management Board. It sets out an exciting and challenging journey blending short-, medium- and long-term actions required to achieve our goal. It has involved analysing data from more than 100 buildings, including residences, spread over eleven campuses and other sites that make up Imperial's vast estate.

We are following best practice, namely looking to reduce our heating and electricity demand first, through a combination of interventions, before exploring sources of low carbon heat, including ground and air source heat pumps. Additionally, we have explored ways of directly generating carbon-free electricity wherever practicable.

Looking at our buildings, the White City South Campus is already designed to be fossil fuel-free; a few others are set to be replaced or decommissioned, but most will be retained and refurbished. For those being retained, ARUP have identified what, where and how to meet our targets quickly and cost-efficiently; investing first in those actions that will have the most impact and make sound business and economic sense.

To do this, ARUP evaluated the cost of energy reduction interventions against energy savings to define the point of diminishing returns. For 50% of the possible maximum capital expenditure spent on energy reduction interventions, 90% of the predicted energy savings can be achieved. This can be demonstrated within Figure 2 below.

Figure 2: Establishing a clear cost threshold for interventions

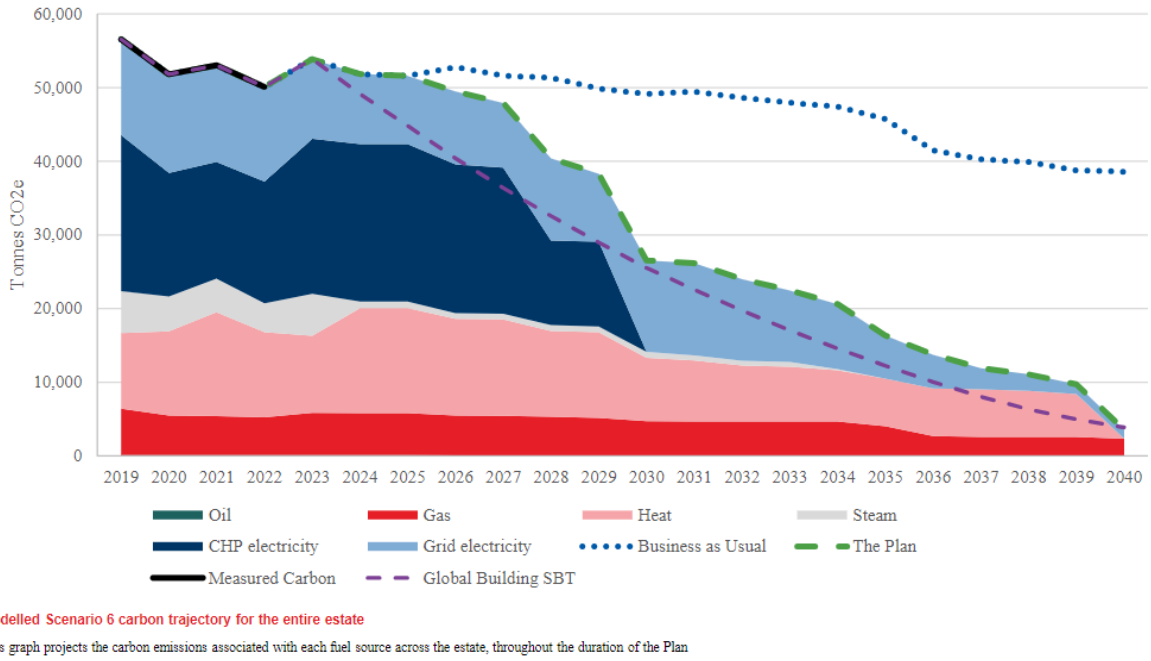


Source: Imperial College London Decarbonisation Plan, ARUP 2023

This identifies that to achieve the last 10% of energy savings an equal spend to the first 90% is required. Alongside this, other physical restraints which would impact on economic feasibility were considered. These included the power and space constraints of our largely central London based estate.

To test assumptions and be clear on our approach, various scenario models were used. This identified what was possible that ensures the steepest approach to net zero while recognising the constraints. Figure 3 compares the emissions trajectory if we carried on without making changes (blue dotted line) with the plan developed (green dashed line).

Figure 3: Business as Usual vs the Imperial Net Zero Plan



Source: Imperial College London Decarbonisation Plan, ARUP 2023

The plan contains some significant milestones, such as the switching off the two Combined Heat and Power engines that feed the South Kensington heat network along with the phased introduction of low carbon ground and air source heat pumps. The figure also shows the plan in comparison to our chosen Global Building Science Based Target (dashed purple line) using the global buildings emissions intensities methodology, set out by the Carbon Risk Real Estate Monitor (CRREM).

Once this overall plan was clear, a programme of works was developed, for the short-, medium- and long-term. This consisted of fast-start projects; reduction of energy demand and initial electrification of heat; and infrastructure upgrades. Every building now has its own condition report, recommendations, and planned works schedule.

This programme relates to what are known as Scope 1 (direct emissions from combustion of gas and other fuels) and Scope 2 emissions (indirect from electricity we purchase and use). Scope 3 emissions from other activities, not completely within our control, such as travel, belong to Imperial's wider sustainability strategy.

Currently, Imperial has the highest CO_2e emissions per full-time equivalent (FTE) student of the UK higher education sector. Science-based Targets (SBT) specific to the education sector are under development but we want to be ahead of that. We will be taking heed of lessons learned, by ourselves and others, and be driven by the knowledge that because we are an energy intensive STEM university, we must do better.

Delivery plans are now being drawn up. While they will affect the people who use our building, they will be crafted to minimise disruption. Departments concerned will be able to see the plans through a Power BI dashboard and the conversations around this will be an integral part of progressing Imperial's journey.

What comes next

Early plans – defined as within the next five years – include such works as electrification of the main kitchens on South Kensington Campus, replacing lighting with LEDs (already underway) and upgrading building control systems to improve how our building services plant is controlled. These will have the biggest impact on reducing electricity demand.

Reducing energy demand and therefore our Scope 2 emissions is the biggest single step we can take, and to which we can all contribute. To do this we are ramping up staff engagement through the Laboratory Efficiency Assessment Framework (LEAF) for laboratory users and the Green Impact scheme for office staff.

During the first five years, planned works will take every cost-effective opportunity to introduce measures including renewables such as rooftop solar panels where there is space. This is due to start at Silwood Park, the campus with the optimum conditions for economically viable solar harvesting, where there is the potential to generate up to 11.3% of the site's needs.

The Property and Major Projects team recognise that the net zero journey does not sit in insolation from the wider Imperial Strategy or other sustainability issues. As planning progresses, and interventions are brought forward, they will be aligned with both the Imperial Strategy and the wider sustainability agenda.

Through addressing these elements, the net zero plan will deliver wider benefits to the Imperial community, including the staff and student experience through improved working conditions in buildings better suited to a changing environment. Further community benefit will be derived through judicious master planning as we programme our works supporting the refurbishment and repurposing of buildings and spaces ensuing that the impacts of embodied carbon are reduced, and designs minimise this potential impact wherever practicable.

Embodied carbon

Every building project causes embodied carbon emissions, principally through the materials used during construction. The embodied carbon associated with a new building is on average twice that of a deep retrofit, therefore retrofit is prioritised wherever feasible. The ARUP plan has identified 26 buildings for fabric improvements, of these, 23 meet the economic viability threshold identified (£55/kWh energy) and three have been selected for their strategic importance.

Generally, buildings that need glazing and roof improvements offer more cost-effective energy savings than those requiring wall upgrades or over-cladding.

Imperial's procurement policy will also support the selection of the most sustainable materials available, further mitigating embodied carbon emissions.

A deep retrofit project already carried out by Imperial was of the Clinical Research Building (CRB) on Hammersmith Campus. This is Imperial's first fossil fuel-free building. The measures taken typify the actions tabled in our net zero programme for our older buildings, new glazing, improvements to insulation and facades to reduce heat loss and wasted energy, and making sustainable material choices, such as ground granulated blast-furnace slag (GGBS). This by-product from steel-making replaces cement in concrete and reduces the carbon footprint of concrete manufacture. It was also used in part on the Sir Michael

Uren building on White City Campus; named after the pioneer of this method, an Imperial alumnus.

Governance

Such is the scale of the task ahead that we will be reviewing actions and impacts annually, and progress will be overseen by our Sustainability Strategy Committee and reported to University Management Board. We will continue to work in partnership with ARUP and our internal Sustainability Expert Group to ensure that as we move between the phases of the programme, best practice is applied.

As the next becomes now, and the later becomes next, plans will be re-evaluated and re-costed, bids will be made for grant funding, and imaginative ways to raise funds for this work will be found. All the time we will be checking our works all make absolute sense technically and allow new innovations to be harnessed.

As one of the world's leading universities, we will commit to reporting on our progress clearly and transparently through our Annual Report and Accounts, and our Sustainability Report. We will ensure we are actively engaging with others working with local programme South Ken Zen+, the alliance for sustainability leadership in Education – the EAUC and others to champion the journey to net zero within the higher education sector.