



Decarbonising and Conserving our Utilities at Dublin City University

A Reflection

In 2016, Dublin City University (DCU) had an opportunity to acquire an old historical campus a couple of kilometres from our Glasnevin Campus. All Hallows, founded in 1842 by Fr. John Hand, was established as a

Catholic Seminary for Foreign Missionaries, and his first base was Drumcondra House, built in 1726 by Marmaduke Coghill, the Chancellor of the Exchequer in Ireland. As our President drove into All Hallows that April afternoon to complete the purchase, his view was of a campus rich in history, set in beautiful surroundings with stunning buildings, and another piece of the vision and the strategic development potential of DCU.

Following closely behind, the Estates Team saw something very different and began their work to ensure the campus was safe, compliant, habitable, comfortable, and to cut down on the massive energy bills experienced by the All Hallows administration over the previous number of years. The answer was plain to see!

This acquisition of All Hallows was also at a time of great change in the university. In September of the same year, DCU completed their



Fig 1. What the President Saw! - Drumcondra House, April 2016

incorporation with the Mater Dei Institute of Education, the Church of Ireland College of Education, and St. Patrick's College Drumcondra. Having admitted its first students in 1980, DCU had now grown to 5 campuses, over 80 buildings and over 16,000 students. The October 2016 energy bill for the new DCU was a very expensive one!

All this change was an opportunity

to strategically plan an energy management and conservation programme for the university, and early in 2017 we set up a dedicated energy team to align energy management practices across all campuses, begin an energy conservation programme, and to cut costs across this new multi-campus environment.



Fig 2. What We Saw! - Drumcondra House, Boiler-Room, April 2016

The first priority in All Hallows was the replacement of the existing heating plant, and with the attainment of 50% Better Energy Community grant funding from the Sustainable Energy Authority of Ireland (SEAI), we completed the refurbishment of all the boiler-rooms by the end of September 2017. We replaced fuel oil with natural gas, reduced energy demand by 650,000kWh (59% above our pre-project predicted savings estimation), reduced energy related carbon emissions by over 300 tonnes, eliminated the expensive historical maintenance and breakdown issues, added efficient Building Management System (BMS) control, ensured complete system reliability, significantly lowering the energy bills, making every space comfortable, and with an overall return on investment of just two years.

Was it a successful and award winning project? Yes.

But would we adopt and execute this approach now? No.

Let's fast forward to 2025!

Transformation

In 2025, DCU has now grown to 6 campuses, has close to 90

buildings, a 22,000 strong community, and is a research intensive fourth level institution. As of the end of 2024, DCU consumed 43GWh of electrical and thermal energy, emitting 9,000 tonnes of energy related CO₂, and costing just over €5M. This is a 53% improvement in energy performance and a 40% absolute energy related carbon reduction compared to the 2016 baseline. Despite more campuses, more buildings, more activity and more people, DCU have significantly reduced our energy requirement across the entire campus community, from what now seems like a very different time, and yet only 8 years ago.

In those 8 years, climate change, whilst always a crucial and important part of the role of an energy manager, has now come fully to the fore. Our mission, as energy champions, is now one of global importance and the decarbonisation of energy systems has become a primary objective for all companies worldwide.



Fig 4. The Polaris Building, September 2024

our very successful retrofit in All Hallows, DCU has built a 10,000 square metre facility without a single gas pipe entering the building. It is a fully electric, heat pump serviced, A rated, Near Zero Energy Building (NZEB), built to better than Excellence in Energy Efficient Design standards (EXEED), has an Excellent rating as certified by the Building Research Establishment through their Environment Assessment Method (BREEAM), and most importantly is Net Zero ready. As the grid decarbonises, so will the Polaris.

This transformation in how we design, build, refurbish and retrofit our buildings, and our energy systems, is a serious challenge, and what we are now trying to adapt to as energy managers. However, at the core of this transformation in energy system design and installation, exactly like the boiler retrofit in All Hallows 8 years earlier, is energy efficiency and energy management. Whilst we are adopting new technologies and setting new, more aggressive, and more ambitious targets, the core principles of energy efficiency and energy management are as important as ever.

System and Strategy

Back to 2016, and to set us on our way, the obvious pathway was to begin with achieving the



Fig 3. Refurbished Boiler-Room, September 2017

Nothing encapsulates this better than our most recent development at DCU, our new, award winning Polaris Building. In this new age, and only a short period of time from

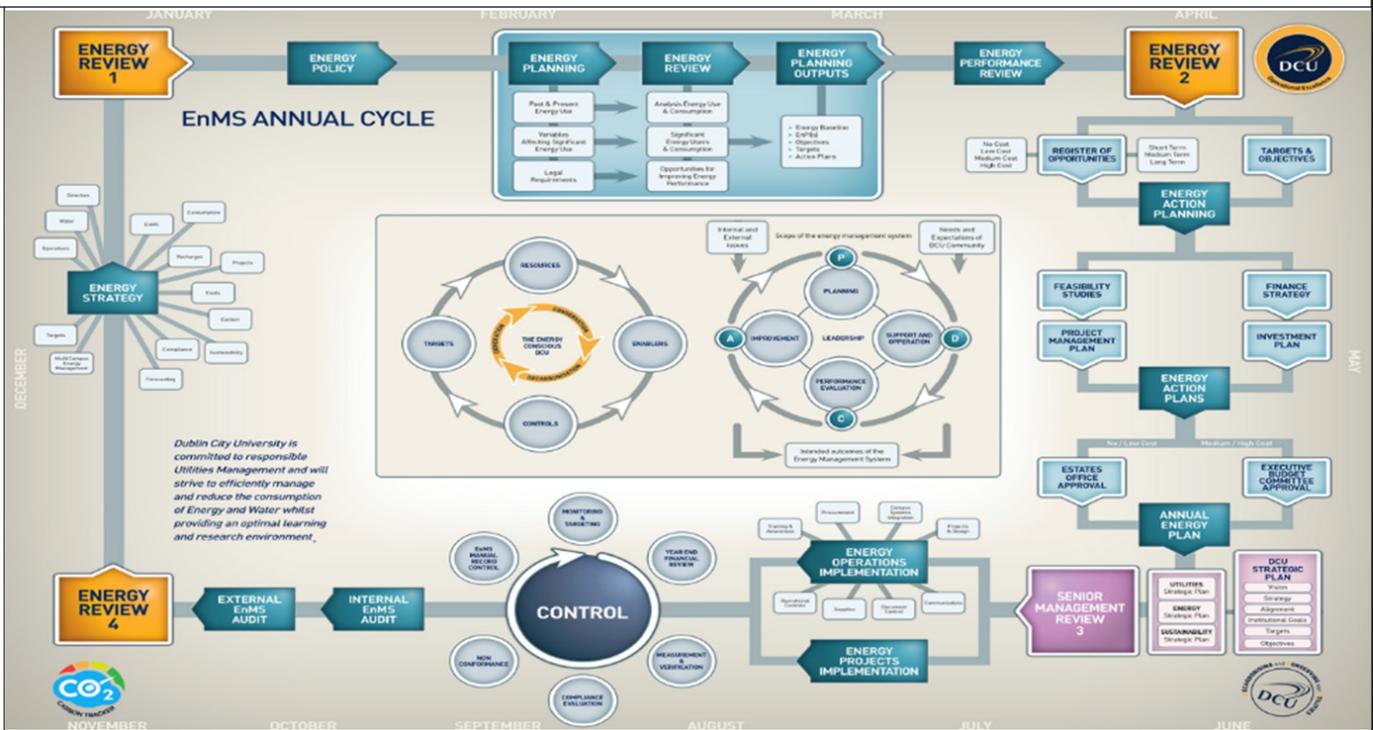


Fig 5. The DCU Energy Management System

internationally renowned ISO 50001 certification across all campuses. This way we could incorporate and integrate all of our energy practices and strategies across all of our buildings and campuses. We achieved full certification in 2017, with the key features of our Energy Management System (EnMS) being the combination of a structured, motivated, forward thinking, strategic and innovative process, which combines the crucial, operational elements needed to manage energy on a daily basis, whilst ensuring the strategic side focusses on sustaining and decarbonising consumption, cost and carbon management into the future.

A four stage approach was devised to align energy planning across all campuses, it included:

- the implementation and full independent certification of the DCU's EnMS;
- the implementation of a multi-campus Energy and Water Conservation and Decarbonisation

strategy;

- setting up of a dedicated Energy Team and a Senior Energy Management Team; and
- the formalisation and structuring of all Energy Operations, where Energy was at the core of all Projects, Operations (Facilities) and Space planning.

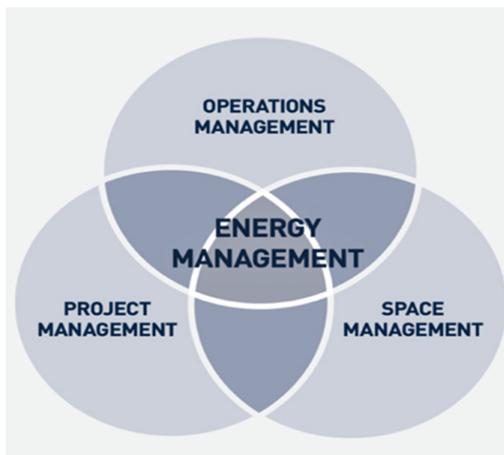


Fig 6. Energy Management at the Core of Estates Planning

Next up was the formulation of an Energy Plan, which was developed and adopted by the Energy Team in 2018. Towards Net Zero, helped guide our planning with a multi-faceted approach to

conserve energy, drive up energy performance, reduce energy related carbon, and create a culture of energy awareness, understanding and appreciation across the DCU community. The plan involved an ordered, but flexible, transition plan to help guide us to reach organisational energy consciousness using net-zero-energy. This was and is our ultimate goal!

Beginning with the crucial requirement for leadership, ambition and real organisational commitment, it defined the need for the completion of our strategic energy plan early in the journey. The next step involved certification of our energy management system to the ISO 50001 standard, but it's important to note here that completion of this stage is only 3 steps of the way on our journey. Once energy management and control is optimised, the adoption of the three key drivers of generation, conservation and decarbonisation

Towards Net Zero

Decarbonising and Conserving our Utilities at DCU



Fig 7. Towards Net Zero – DCU Strategic Energy Plan

allow us to develop all of the required enablers to develop an energy efficient, carbon efficient and energy smart campus, with the required infrastructure to employ the sustainable and renewable solutions to allow us to move towards net zero. Through culture, technology, short-, medium- and long-term planning and a systematic, ambitious, experimental approach to energy management, we had our plan towards net zero energy consciousness. Having an energy management system is a very important part of any energy plan, but the certification was an organisational decision that not only enhanced our energy management

capability, but also bettered our overall institutional climate and sustainability planning and implementation. It gave us backing,

motivation and drive, and should be the cornerstone for every organisations journey towards sustainability.

As always, people are the key and with ongoing technology advances, we felt that along with our entire community, we now had a realistic roadmap, a clear direction and a pathway forward. Our journey now needed a practical, economic, executable plan that could action each of our enablers and deliver on our ambition.

Targets, Planning and Action

DCU has two government led prime targets for 2030. The first is an energy performance improvement of 50% against a baseline of 2009 and the second, a much more onerous target, is an absolute energy related carbon reduction of 51% against a 2016 through 2018 baseline. DCU is ahead of these targets and through a deep seated desire to be leaders in climate change, we have set our own more ambitious internal targets.

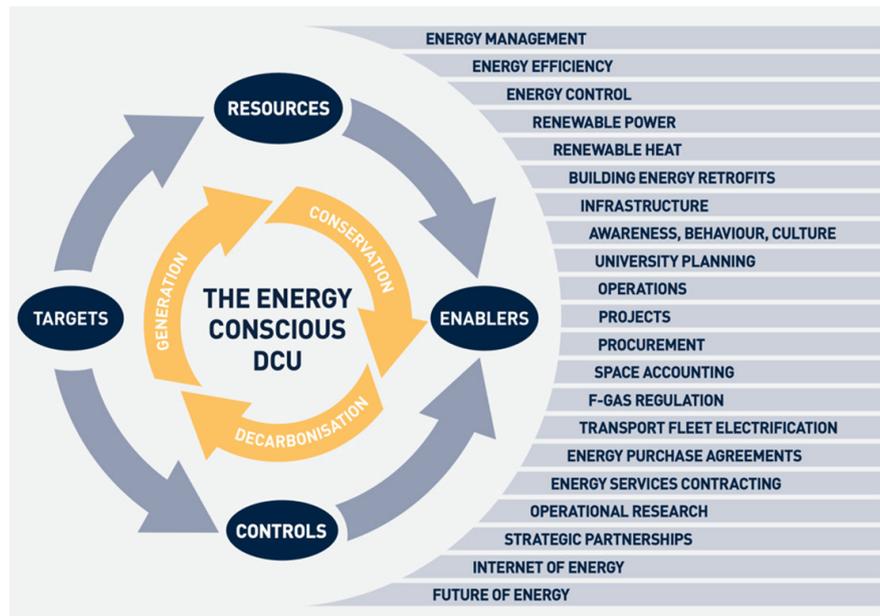


Fig 8. Towards Net Zero – Drivers and Enablers

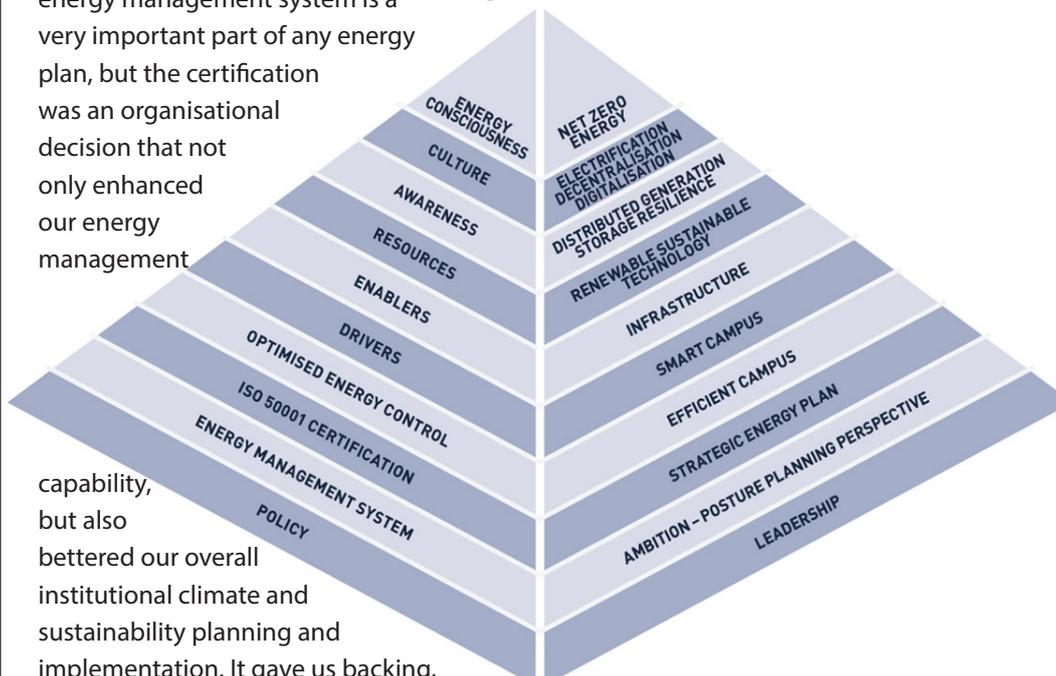


Fig 9. Towards Net Zero - Timeline Transition Progress Plan

In terms of energy performance, we are heading towards a 70% improvement target and in terms of absolute elimination of energy related carbon, we are planning towards a 60% reduction target.

When it comes to energy management, our senior leaders are policy

drivers, not policy driven. We plan transformationally, not incrementally, and in terms of perspective, we consider ourselves revolutionary, not reactive. Leadership and ambition were key ingredients needed for our plan to be successful, and when coupled with a dedicated energy team, we were then in a position to execute our plan. It started with a statement of intent:

“sustainability reflects not only our commitment to play our part as a responsible organisation, but also our realisation of the messages we can convey as an exemplar organisation to both our students and society around us”

and then a simple equation to execute our plan:

guidelines to help everybody across DCU get involved. These rules must be followed by everybody across the DCU community, and by keeping them simple, they have become effective.

- Plant replacements must reduce or remove fossil fuel requirement.
- New Builds must not use fossil fuel.
- Refurbishments should reduce fossil fuel requirement.
- Refurbishments must comply and ideally better both (n)ZEB and EXEED standards.
- Space solutions must be sustainable solutions.
- Complete an energy intensive annual Energy Action Plan (EAP) to save 1GWh.
- Complete a decarbonisation intensive longer-term Pathfinder

We modelled and simulated the building and the services design from the very start to optimise its performance. We then ensured the appointed contractor also model the building for energy and carbon performance prior to starting on site. This was to ensure the contractor assumed responsibility for the building performance during the construction stage. DCU now had added confidence on how the building would perform which enabled us to further challenge the design team, and now the contractor, to handover the Polaris as a low energy, low carbon and net zero ready building. One year post-handover, the Polaris has landed softly and is performing extremely well. The second year of operation will be key to fully understanding

TARGETS + AMBITION + RULES + POLICY + SYSTEM + STRATEGY = PLAN

By early 2018 we had our targets, we had ambitious leadership, we had a certified energy management system, we had a well-defined energy policy, and a well thought out energy strategy. To round this all off, we created simple rules or

Project Plan (PPP).
 • Communicate our energy message to the entire community.
 We decided in 2018 to stop all fossil fuel from being designed into new developments. The Polaris Building is now a testament to this.

the building, and to drive energy performance up further. We have 50,000 square meters of campus residences planned for development over the next five years, and as well as being designed as A rated facilities, they will be fully compliant



Fig 10. Woodlock Hall Library – Heat Pump Solution for a Traditional Space

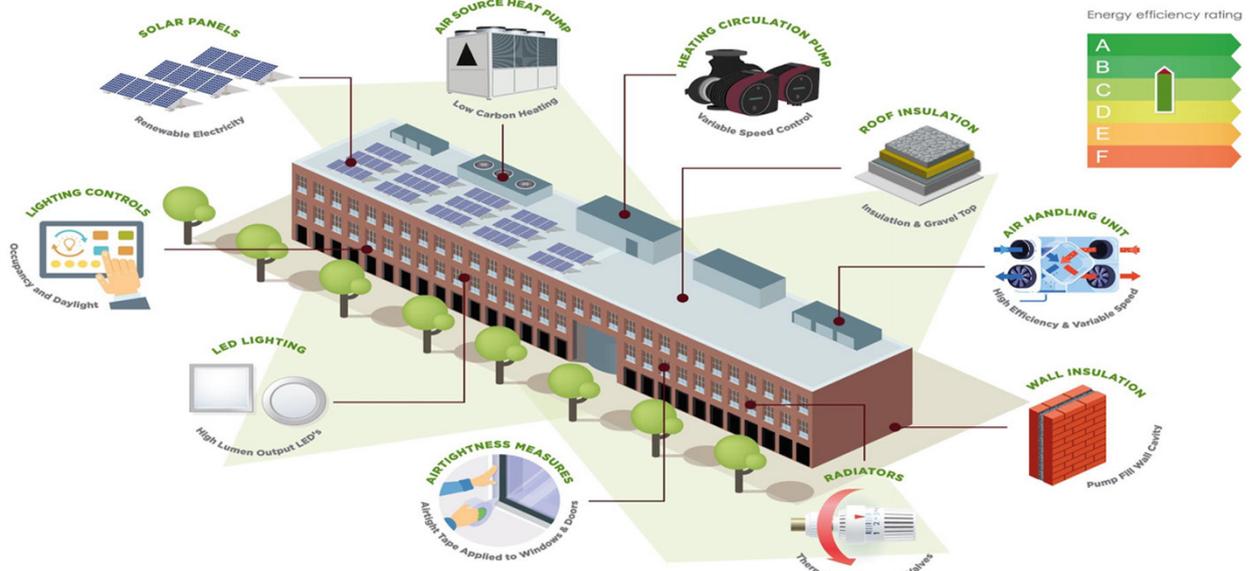


Fig 11. Marconi Building - Energy Rating & Decarbonisation Retrofit

with (n)ZEB and EXEED, and built as net zero ready buildings. The learnings from the Polaris will be fully integrated into the residences development.

Our mantra for development of any kind, when at the very conception stage of a project, is best summarised as follows:

“the strategy for all projects and refurbishments shall be to utilise natural passive systems where at all feasible, thus reducing our energy demand to the absolute minimum. The remaining energy requirement shall be met by incorporating high efficiency low carbon systems complimented with fully optimised automated intelligent control”

Early in the journey we began working closely with our facilities teams and contractors to use plant replacements as opportunities to not only conserve energy through more efficient plant, but to electrify or decarbonise this equipment where at all possible. We looked at the bigger picture in terms of making the systems, where the plant was being replaced more energy efficient, better controlled and low carbon where possible too.

Space management was key, in that all reallocation solutions, across the entire university building stock had sustainability as a key requirement. It enabled spaces to be greened across the DCU campus network as new activities were planned into existing locations.

With our projects teams, we wanted to use every project as an enabler to make the completed solution more energy efficient and to reduce the energy requirement of the completed refurbishment. Upgrading to a Building Energy Rating of mid to high Bs is what we are trying to achieve across all of our traditional and more modern building stock.

Electrified solutions like the refurbishment of Woodlock Hall have proved very successful in terms of energy consumption, cost and carbon, and show that heat pump technology can work in older buildings, with the seasonal co-efficient of performance (SCOP) reaching 4.2 within the library space.

Our recent refurbishment of the Marconi Building has not only reduced our energy requirement by 40%, but has brought the building

fabric to a modern standard that will extend the economic life span of the building for years to come. The Building Energy Rating went from D1 to B2!

Energy action planning is a very important element. Each year we target, plan and execute 1,000,000kWh of energy savings. In the earlier days, they included boiler replacements, lighting retrofits and controls upgrades. These days, the plans include PV, fabric improvements and heat pump integrations. Over the past couple of years, the emphasis is on government Pathfinder projects, where DCU is trialling new and improved technologies to retrofit building fabric and decarbonise energy generation and utilisation.

All of these works benefit from government supports and grants, and ensure the projects deliver quality with economic prowess, have a positive return on investment, and that they contribute to the longer-term decarbonisation targets for public sector institutions. Since 2017, DCU has received over €4M in grant aid and support whilst delivering these annual energy action plans.

Integrating all of these operational and project solutions are our Building Management System (BMS) and Energy Management

campus competition to help design an awareness campaign that could work specifically for us. This resulted in DCU UNPLUGGED.

the overall journey, and adds more value to what we do.

The Energy Conscious Net Zero DCU

In 2016, when we had our first brainstorming session as an energy team, we decided to try and simplify our mission by defining our own meaning of energy management within a university setting, and it still holds true to this day, even though we are operating in quite a different environment.

“energy management is the simplest way to eliminate expensive waste and reduce our bottom line at DCU. It is a quick, easy and risk-free

way to sustainably improve financial stability for the university, improve energy team profitability, and generate real and sustainable savings through avoided energy costs”

“Energy management can only work to the optimum level when people are at the heart of the revolution.”

You can see from our original statement of intent that our primary focus was on reducing energy consumption and in effect



Fig 12. DCU UNPLUGGED

System (EMS). These two core energy management tools are how we manage energy on a daily basis and how we ensure our projects are successfully delivered to maximise energy efficiency. They are the constants within our energy management system, the glue that knits everything together. In tandem, our Metering & Targeting (M&T) and Measurement & Verification (M&V) methodologies ensure we consistently reach and surpass each target so that our collective goals get closer and closer. Learning by trialling, building rationalisation, living laboratories and experimenting our way to energy savings, is how we think and how we deliver. Using innovative but very simple techniques, such as baselining, exception scheduling, outside hold off, CO₂ control, and master scheduling has added to our success.

People are crucial to this energy transformation. Everybody has to be on this journey together. In 2020, to get the entire community on board, the Estates Team led a cross

Whether a student, supplier or visitor to the campus, this campaign creates awareness of how we can all contribute to good energy management practices, and another important part of the value chain needed to link with all of the technology solutions and add real value. Energy management can only work to the optimum level when people are at the heart of the revolution.

Students are at the heart of DCU. By delivering guest lectures to our engineering and business undergraduates, and by providing data and test-bed facilities to our Master's and PhD students and researchers, we contribute to the development of those who will carry the mission forward after us.

Community is important, not just our staff and students, but society around us. In recent years we have attained energy grants for local fuel poor housing, St Michaels House and our own DCU charity, Barretstown. Working with and for our local community is important in

cutting our energy bill costs. A 2023 independent report has established that since the start of our campaign in 2017, and when compared to business as usual, DCU has avoided 65GWh of final energy consumption, with conservative cost savings amounting to over €7M, and with avoided emissions of over 17,000 tonnes of CO₂.

Our Energy Performance Indicators (EPIs) are testament to that. In 2016, our Energy Utilisation Index (EUI) was 217kWh/sq.m. In 2024, it was 167kWh/sq.m. In 2016, our Energy Consumption per Person (ECP) was 2,807kWh. In 2024, it was 1,947kWh.

part of the journey is ahead of us, we cannot let up, we need to refocus and reset.

What's next for DCU?

We are planning a high temperature heat pump integration into the district heating network on our St. Patrick's Campus, planned for completion in 2027. This will save upwards of 700+ tonnes of CO₂ per annum and this project alone will take us very close to our 51% target. Our pipeline of renewable heat and decarbonisation projects over the next five years also include the Nano Research Facility, the School of Nursing and the Glasnevin

efficiency and the importance of optimising energy management beyond just clean energy supply. Who knows if targets will change, maybe they will soften or maybe they will become even more ambitious, but one thing is for sure, and that is energy management should always be at the centre of every business model. Energy management and energy efficiency are still the key to our energy transition.

Below is a graphic of our journey since 2016 and our targets for 2030 and beyond. Let's see if we can try for a 2037 goal of a low energy, zero carbon, energy conscious DCU!

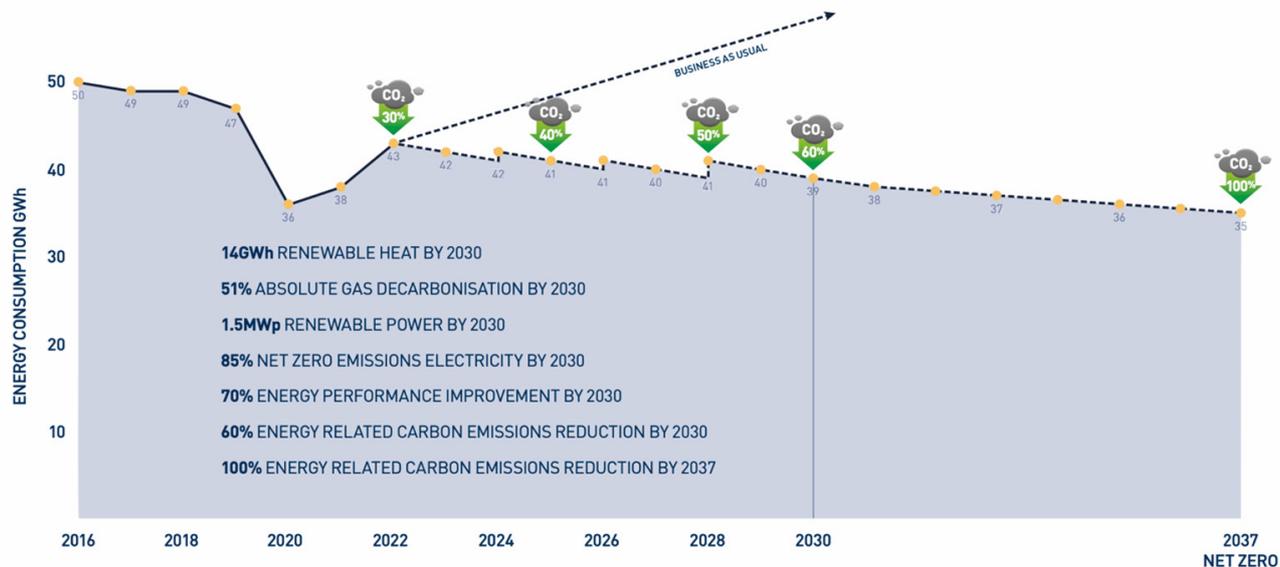


Fig 13. The Low Energy, Zero Carbon, Energy Conscious DCU

In 2016, our energy related Absolute Carbon Elimination (ACE) was 15,013 tonnes CO₂. In 2024, it was 9,027. And all these EPIs have been achieved despite more campuses, more buildings, more spaces (up on 30,000 square metres to put a number on it), and more and more and more students. With our ambition, our leadership, our strategy and our action, we have surpassed our mid-decade targets, winning numerous energy and water conservation awards along the way. However, the more difficult

Library with potential savings of 600 tonnes of CO₂. In terms of renewable power we have 2MWp of Photo Voltaics (PV) planned across the Glasnevin and St. Patrick's Campuses generating approximately 50MWh of electricity and saving DCU up on €300,000 year on year. With grant aid, this project can be delivered with a 7 year return on investment. But even with this new onsite renewable heat and power generation enabling future energy storage and off-grid operation, we must continue to focus on energy

Author's profile:

Richard is Estates Manager at Dublin City University. He is a Chartered Engineer, Certified Energy Manager, Certified Measurement & Verification Professional, Certified Water Steward and an ISO 50001 Energy Management System Lead Auditor. He is both a member of the Energy Institute and Energy Managers Association, and has specific interest in Energy Management Strategy, Energy Systems Certification and the Decarbonisation of Energy Systems within the Built Environment.