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IHEA
Institute of Healthcare Engineering, Australia

HEALTHCARE FACILITIES



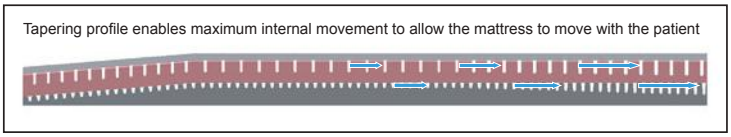
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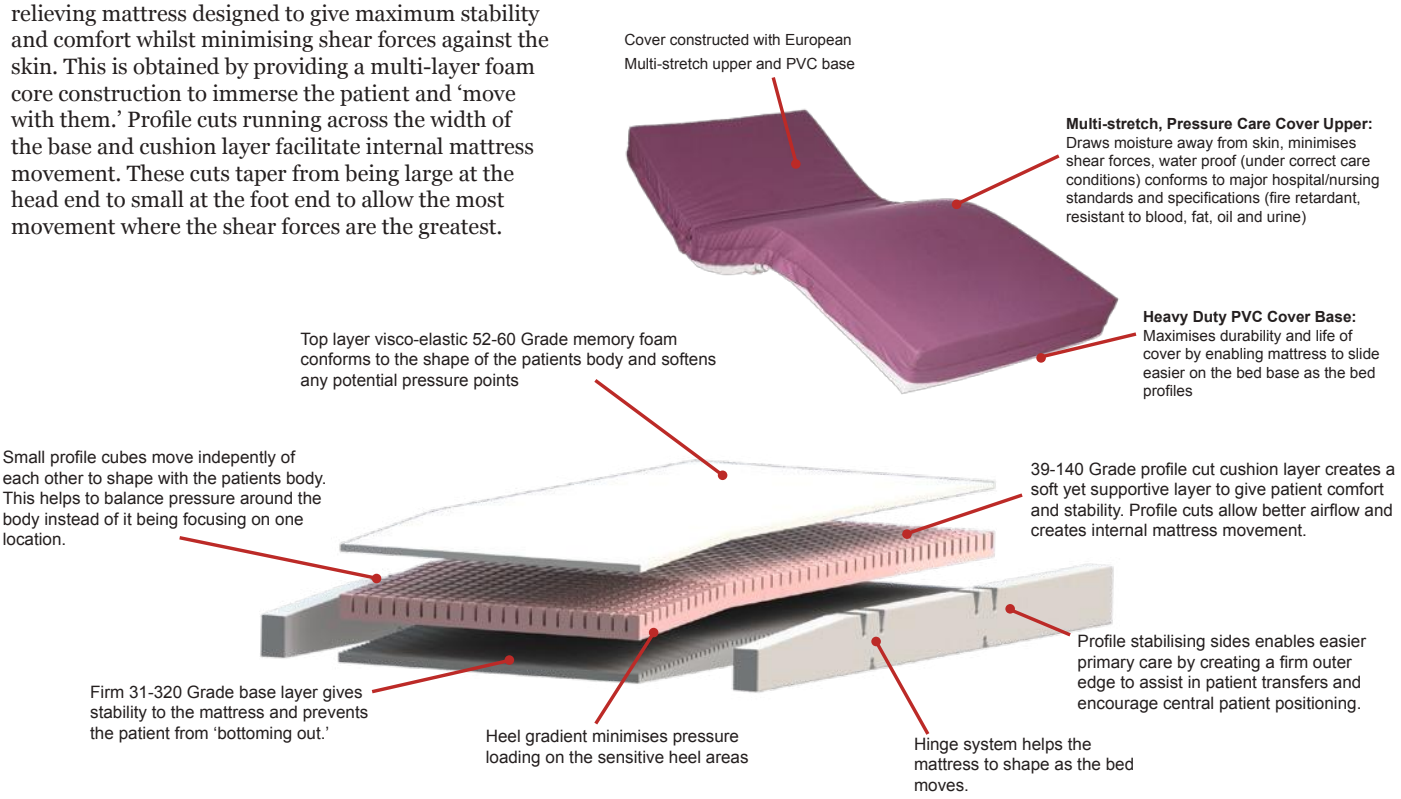
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THE CLINICAL COST OF NUISANCE

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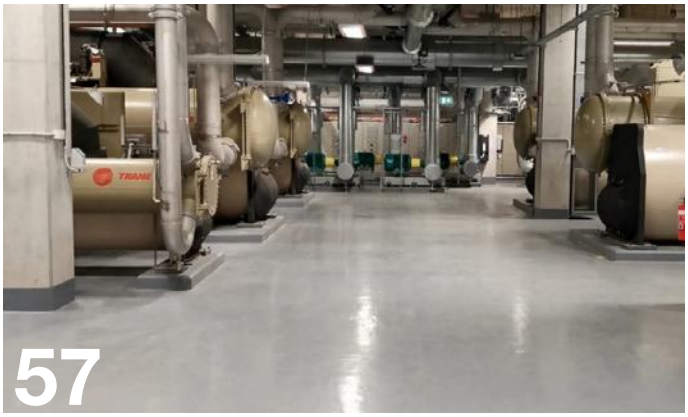
- Sleep Deck Width: 900mm – 1050mm
- Sleep Deck Length: 2000mm – 2200mm
- Minimum Height: 184mm
- Maximum Height: 760mm
- Safe Working Load: 250kg
- Maximum Back Rest Angle: 65°
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Seaworld Resort Conference Dinner

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Editor's Message



I BEGIN THIS EDITORIAL having returned from the 2026 National Conference held at the Sea World Resort on the Gold Coast. What a week! It was absolutely brilliant. The keynote speakers and plenary sessions were inspirational, educational and entertaining. Two personal standouts were the keynote presentation from Mr Steven Bradbury and the conference best paper, a collaborative effort between Mr Mark Hooper and Mr Ben Gill.

Personally, I am a fun park tragic and holding the conference at Sea World and giving me a free day pass is asking for trouble, actually the real issue is that I have never really grown up. To clarify, whilst my inner adolescent may say 17, my body reminds me that it is 67.

Engineers have a special appreciation for the beauty that resides within a mechanical structure. For myself, this is true for planes, trains and automobiles however, when it comes to roller coasters where gravity dances with the centrifugal forces in a symphony designed to scare the daylights out of someone, I take it as a personal challenge to see if my fellow engineers have met the brief.

There are two roller coasters at Sea World, being The Storm and The Leviathan, now The Storm is constructed from steel and there are engineering limits to how far one can bend steel, so the ride ends up being smooth and a little tame with the G forces staying well within the safe limits. I rode this several times and enjoyed each but was never rattled out of my skin.

The Leviathan on the other hand is made from wood and the engineers must have forgotten to read the memo about the human body only being able to withstand up to about 5Gs and still be able to walk away. The climb out to the peak was like every other ride (ho hum been here before) then as we breached the summit, The Leviathan showed its true character, for on the drop into the first 90 degree plus turn, it tried to drive my spine into the seat and from that point on, the ride became series of "what other part of the body can I hurt".



The Leviathan



Made from Wood

Don't get me wrong I ached for days after but by almighty God The Leviathan is one wicked ride, but once was more than enough. The aches and pains were well worth the 90 seconds of terror and torture. Full kudos to the design engineers. The only improvement I would suggest is for the park to provide wheelchairs to escort the departing riders to the exit.

On the flight home I was lamenting how uncomfortable my seat was, this had nothing to do with QANTAS, it was due to my sore bum bone (coccyx). A thought dropped into my head about why did I do this? I mean I know I am not 17 and that my body will take a lot longer to recover than it used to, so why did I or more to the point we subject ourselves to the consequences of riding roller coasters and other thrill seeking rides. Is it the thrill and excitement or something deeper? A perfect segue into this editorial topic.

There are many excellent books that describe the human journey, each with differing views on how we arrived at this point in time. I will let you decide which journey meets your own beliefs, but each book basically says, and I have read quite a few that being human is to be fallible and that means sometimes we do very stupid things in the name of some mistaken notion or idea of self preservation. All that is required is a trigger and away we go, then it is all about me and mine! Nobody is immune.

Remember covid when people raided the supermarket shelves for…. wait for it ... Toilet Paper and the fights that ensued over the fear of missing out on the material that wipes one's bum. I wonder if those who fought over a roll of paper reflect now on how petty and stupid they were. Maybe huh probably not!

Today the world is facing some of its greatest challenges where a few politicians believe they have the right to play with the world's future. You know what the tragic thing is, nobody knows why they do what they do. Their lame excuses are always found to be wanting and some are exposed as outright lies. I will lay odds on, that those politicians are acting in self interest and not in the interest of those they were elected to protect.

The ransom being held over the world's energy reserves is the new trigger and that thing that resides in all of us has started to show itself once again. Fuel has become Australia's 2026's toilet paper. The profitering, the service station concourse arguments, the drive away thefts, the kilometre long queues to save a few cents and inevitable queue jumping and not to forget the angst and selfishness on display when someone buys more litres of fuel than what they would normally. Filling a small jerry can with fuel for your lawn mower is viewed with disdain, and why? It is all in the Fear Of Missing Out (FOMO). You know FOMO lives in each and everyone of us and it is a real malady, but why so?

We live in an era of plenty. In fact the world produces way more than we actually need. Think about it! If there was not an over abundance of things, a lot of the world's current environmental issues would not be so prevalent. Now the hard bit, the greater bulk of today's population has never lived in really hard times, I mean times of war, famine or rationing and those who have, which sadly most have left us, took with them the experience wisdom and life skills that going without has taught them. I can understand for those who are living through the ravages of war or famine FOMO becomes a sort of a survival instinct but surprise! Australia is not at war nor is there a famine.

This does not mean our privileged lifestyle is wrong, it just shows that we simply do not know how to or more to the point have been taught how to live in a community where respect, compassion, justice and hospitality are essential for peace. We do not have to fight for our survival.

How does one fight the temptation of FOMO? My simple rules are take only what is rightfully yours, take only what you need and not what you think you might need and willingly leave the remainder to be shared across the community. FOMO has the characteristic to exacerbate a situation transforming a short time of constraint into a long time of famine.

I have every confidence that the current situations will eventually be resolved and the fuel crisis will dissolve into the past but what will happen when things are finite and there is no resolution available. Such as when the fossil fuels are finally exhausted or climate change has grown so bad that it has limited our ability to grow food. Scary thoughts aren't they!

It is time we look at who we are and where we are heading and especially who we are placing in charge of managing this planet and the futures of our children. There are some wise and pragmatic people who lead their communities with vision, diplomacy and compassion and to this end I include all levels of leadership, to you we salute you and thank you for your efforts.

I often wonder if those politicians who currently hold the world's future in their hands have ever had to stand in line to buy a roll of toilet paper, a litre of fuel or wondered where their next meal is coming from or even worried if they could afford to look after their family, the cynicism within me says I bet not! Have they ever seen hard times or are they just a puppet of their own FOMO egos?

In the 1875 poem "Invictus" by Willian Ernest Henley, he states that " I am (you are) the master of your fate (destiny) and the captain of your soul (the consequences of our actions). This is a truism that extends beyond your own personal boundaries and onto your responsibilities to your family and to your close associates and then ultimately onto your community. Your decisions and actions have consequences. So the next time you recognise your FOMO arising think twice before acting and when you see it in others call it out for what it is!

For me the call of the fun park is still loud and clear and lets hope my health insurance can cope.

Stay safe in these uncertain times.
Frederick Foley – Editor

National President's Message



FRIENDS,

The past quarter has again highlighted the pace of change and investment occurring across Australia's healthcare and aged care sectors. Healthcare engineering continues to play a central role in shaping the environments in which care is delivered.

Across Australia, governments are responding to increasing demand through significant investment in healthcare infrastructure, service reform, and new models of care. Victoria's new Footscray Hospital officially opened earlier this year, representing one of the nation's most significant healthcare infrastructure projects and bringing together clinical care, research, education, and community services within a modern, future-focused campus. For many IHEA members, this project holds particular significance, having been featured as a technical tour during our 2024 National Conference in Melbourne. To see the facility transition from an active construction site to an operational healthcare environment is a powerful reminder of the scale, complexity, and impact of our profession and the opportunities IHEA provides to members.

Nationally, the continued rollout of Medicare Urgent Care Clinics and the recently updated National Health Reform Agreement reflect a growing emphasis on integrated and community-based healthcare delivery. In parallel, aged care reform continues to accelerate, with the forthcoming Support at Home program and the implementation of the new Aged Care Act later this year signalling a shift toward more person-centred and accountable care models. Investment in aged care infrastructure and smart technologies is also increasing, particularly in regional communities.

Technological innovation remains a defining theme across healthcare engineering. From AI-enabled hospital workflow pilots and digital integration projects to advanced monitoring systems within aged care environments, technology is increasingly influencing how facilities are planned, operated, and experienced by patients, residents, and staff alike.

Finally, I would like to acknowledge the outstanding success of the 2026 IHEA National Conference held in March at SeaWorld on the Gold Coast. The quality of presentations, technical discussions, industry engagement, and fellowship throughout the event demonstrated the strength and professionalism of our sector. My sincere thanks go to the conference committee, sponsors, presenters, volunteers, and delegates whose contributions made the conference such a memorable and valuable occasion. I look forward to seeing you again in WA in November.

Best regards,
Michael

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New South Wales/ACT

HELLO EVERYONE FOR the Autumn addition.

The NSW/ACT Branch Management Committee has had a strong start to 2026, with a focus on delivering valuable professional development opportunities, strengthening member engagement, and building on the success of last year's events.

The Management Committee - comprising Cameron Ivers (President), Anne-Louise Towers, Justin Turner, Malcolm Johnston, Wes Abbott, Jason Swingler and Lisa Preston - has been meeting fortnightly to discuss priorities, plan upcoming events, and explore new ways to better support and engage our members.

Upcoming Site Tours

We are currently finalising arrangements for a number of exciting site visits for members:

- A Zip Water headquarters tour is being planned for late May, offering insight into manufacturing, innovation and water solutions technology.
- A Wilhelm Integrated Solutions site visit is proposed for June, with a hands-on look at operating theatre integration and clinical technology solutions.
- The committee is also progressing discussions with Health Infrastructure NSW to facilitate a potential tour of the Nepean Hospital Stage 2 Redevelopment, which would provide members with valuable exposure to a major health capital project.

Professional Development Day & Harbour Cruise

Planning is underway for our flagship IHEA/SMBE Professional Development Day and Harbour Cruise, following the great success of last year's event.

Save the Date: Friday 4 December 2026

The Management Committee is working collaboratively with SMBE to develop a program that brings together infrastructure and biomedical engineering perspectives, with a focus on technical risk, innovation, and workforce resilience.

Charity Contribution – Backpack Beds for Homeless

We are pleased to share that the NSW/ACT ranch raised $1,100 at the 2025 Golf Day in support of Backpack Beds for Homeless. The committee has recently re-established contact with the charity and is progressing arrangements to formally present the donation.

Member Engagement & Improvements

The Committee continues to look at ways to improve accessibility and grow membership, including:

- Introducing QR codes on promotional materials to simplify sign-up
- Reviewing the current membership payment system, particularly the monthly payment option, to remove barriers for new members

Looking Ahead

The NSW/ACT Branch remains committed to delivering meaningful opportunities for collaboration, learning, and networking across the healthcare engineering and facilities management sector. We look forward to connecting with members at upcoming events throughout the year.

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WELCOME TO 2026. I hope you were able to enjoy some time off with family and friends over the holiday period, although I'm aware that many Hospital Facilities Engineers were busy delivering refurbishment works across their facilities during the typically quieter January period.

Victoria has also seen significant infrastructure milestones early this year, with two major hospital openings in January/ February: the new Peninsula University Hospital ($1.1B), formerly Frankston Hospital, and the new Western Hospital in Footscray ($1.5B).

Regards,

Michael McCambridge, John Mihalinac, Steven Ball, Pablo Perez-Reigosa, Michael Goodman, Vanessa Galina

Branch Activities

Lunch & Learn: Designing Safe, Inclusive and Accessible Health Precincts: A Total Design Approach

Date: Wednesday, 25 February 2026
Time: 12:30 PM to 1:30 PM
Location: Zoom
Attendees: 49



Alice Vincent, Arup

Alice brings deep expertise in designing safe, inclusive public spaces, applying security design principles to mitigate risk and enhance comfort for all users especially women and other vulnerable groups. Her recent work at the Westmead Health and Innovation Precinct combined lighting, security, and urban design strategies to create a welcoming 24/7 environment. At the Randwick Health Precinct, she led technical assessments and co-design walkshops to better understand how perceptions of safety shift at different times of day.



Rebecca Cadorin, Arup

Rebecca's work centres on building more equitable urban environments through participatory design. She collaborates closely with communities including women, girls, and marginalised groups to ensure their voices shape safer, more responsive public spaces. Her experience spans health and education precincts, and she has contributed to leading policy and design initiatives such as the Women's Safety Strategy for The Rocks / Tallawoladah (as part of the NSW Safer Cities Program) and the Queering Australian Cities publication advocating for inclusive urban environments.

Healthcare precincts operate around the clock, serving diverse communities whose needs and experiences vary widely across day and night. This session explored how intentional design can transform these environments into safer, more inclusive, and seamlessly connected 24/7 community hubs.

Alice and Rebecca draw on Arup's "Total Design" ethos an approach that integrates security, urban design, accessibility, and user experience to demonstrate how holistic, people-centred thinking can reshape the way health precinct's function and feel.

Together, Alice and Rebecca will share practical insights from recent case studies at Westmead and Randwick, outlining strategies for improving perceived and actual safety, strengthening connectivity, and embedding accessibility and equity as core design principles within health precincts.

Lunch + Learn: Changing Healthcare for Good

Date: Wednesday, 25 March 2026
Time: 12:30 PM to 1:30 PM
Location: Zoom
Attendees: 25



Oliver Hunt is the founder of Medsalv, a social enterprise pioneering the remanufacture and safe reuse of medical devices previously treated as single use. Trained as a mechanical engineer at the University of Canterbury, Oliver developed the concept during his master's degree after recognising that many medical products were being discarded despite their potential for safe reuse.

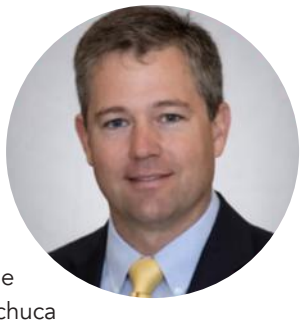
Starting with a single device thrombosis prevention sleeves he developed a process to inspect, clean, test and remanufacture them for multiple uses.

Medsalv now applies this approach to more than 50 products across nearly 170 hospitals in New Zealand and Australia. The model reduces waste, lowers costs for healthcare providers, and creates local employment, including for people who face barriers to work.

Oliver shared his insights on turning complex waste challenges in large-scale systems into scalable, real-world solutions through engineering.

Lunch + Learn: Bushfire Smoke, Energy & Hospitals: The Echuca Experience

Date: Wednesday, 08 April 2026
Time: 12:30 PM to 1:30 PM
Location: Zoom



Mark Hooper is an accomplished engineering and project management professional with over two decades at Echuca Regional Health, where he serves as Executive Project Manager. Mark has led major capital works projects including the $65.6 million redevelopment of Echuca Hospital, and oversees sustainability initiatives, compliance and engineering services.

A former Board Member of the Institute of Healthcare Engineering, Australia (IHEA), Mark is also an active Country Fire Authority (CFA) volunteer, with nearly four decades of service. His career combines technical expertise, leadership and community commitment, supported by engineering qualifications from Swinburne University of Technology and La Trobe University.

Mark explored the real-world challenges hospitals face during bushfire events, particularly the operational and energy impacts caused by heavy smoke conditions. Drawing on practical experience at Echuca Regional Health (ERH), Mark will share insights into how healthcare facilities can strengthen resilience, preparedness and operational continuity in the face of increasingly complex environmental risks.

The session highlighted the importance of integrated planning across engineering, facilities management and emergency response, and will provide valuable lessons for healthcare infrastructure professionals responsible for maintaining safe and reliable hospital operations.

Lunch + Learn: Solutions for Nitrous Oxide Reduction in Health Facilities

Date: Wednesday, 22 April 2026
Time: 12:30 PM to 1:30 PM
Location: Zoom



Rodney Kay, Commercial & Service Director, who brings extensive experience in medical gas systems and compliance across healthcare environments.

As healthcare facilities face increasing regulatory, environmental, and occupational health pressures, reducing nitrous oxide (N_2O) emissions has become a critical focus for engineering and facilities teams.

This session will provide actionable strategies to respond to emerging guidance around reducing nitrous oxide use and supply within health facilities. Rodney will outline how organisations can minimise emissions and occupational exposure through:

Supply model optimisation

Point-of-use bottled gas solutions
Staff education and behavioural change
Exposure monitoring frameworks
Standards-compliant inspection and maintenance in accordance with AS 3551 and AS 2902

We learned about a practical, engineering-led steps to achieve measurable reductions in emissions while maintaining patient safety, clinical effectiveness, and regulatory compliance, standards-aligned action toward safer and more sustainable nitrous oxide management.

These session is available on IHEA Website under the members section – Resources Learning + Professional Development | IHEA

Committee meetings are held monthly on the 2nd Wednesday at 9:30 am via Teams. Branch members are welcome to attend—email the Committee of Management for an invite.

Michael McCambridge
Vic/Tas Branch President

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Footscray Hospital 2023

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Western Australia

I AM WRITING THIS on the last day of 2025, an appropriate time to reflect on the past year. In my opinion and despite the issues currently plaquing our world, 2025 for our members has been a bumper year of interesting and educational sessions. To deliver such first-class events is no easy feat and on behalf of all of our members, I want to sincerely thank those who sat on the 2025 Committee of Management and branch Executive for your hard work, dedication, commitment and passion. Without your contribution, things just would not have happened.

I am sitting here reminiscing about the 2026 IHEA National Conference held at the Sea World Resort on the Gold Coast where 24 Western Australians took the opportunity to attend. We were not disappointed. Full accolades must go to our Queensland colleagues and to the ladies from Iceberg for putting on such a wonderful event.

Putting my delegate hat on, I had a ball of a time. I got to listen to some excellent technical papers, all will be reproduced across this and future journals. I recommend you look out for the top paper of the conference, a collaborative effort, no spoiler alert here, Oh just a small hint, it was about measuring air quality that is all you get. You will just have to read them and decide for yourself, I guarantee that you will not be disappointed.

I was particularly impressed by the inspirational talk from Steven Bradbury. A gold medal truly earned and thoughtfully won. 3 Western Australian delegates of which I was one were granted the privilege to swim with the sharks. They said it could be dangerous but the only dangerous bit I experienced was trying to fit into the wet suit, and I add that once you see yourself in a wet suit, it cannot be unseen, I wonder if they hold therapy sessions. The experience of swimming alongside the sharks, the rays and the other fish is a memory we will hold for a long time.

There was time spent at the fun park and riding those roller coasters, great stuff! The fun park theme carried over



The Iceberg Ladies







Swimming with the Sharks

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into the conference dinner and there is nothing like a couple of side show games to bring one's competitive side out into the open. Keeping with tradition, I was one of the diehards who, when the stumps were drawn on the dinner, had to be escorted out of the park by the security team, and during a tropical downpour by the way. We all got absolutely soaked… an excellent end to a great day.

The Sea World site visit to the Shark Tank was extraordinary. The care and management of the tanks, the water quality and ultimately the occupants contained therein demands the same passion, dedication and expertise that we as healthcare facility managers must possess to ensure the safety and well bring of those under our responsibility. The management of the sea water quality alone would rival anything we do for legionella control. Our thanks go to Mark and Shane, our Sea World Shark Tank facilitators for your dedication, your passion, your hospitality and openness.

I was particularly impressed by Mark's comment to a question being "These creatures did not ask to be here on display so it is my responsibility to ensure that no harm comes to them". This is the same sentiment Hospital Engineers and Healthcare Facility Managers demonstrate.

That is enough of our Gold Coast adventures, now to the rest of our news. These past months have been a bit lean on events, the reason being, the Western Australian Executive received a National Board bomb shell dropped at the March board meeting. Western Australia has been given the responsibility of hosting the 2026 / 2027 National Conference in November 2026 scheduled from Monday the 16th to Wednesday the 18th at the Fremantle Esplanade Hotel. Full details to be published later, but save the date, NOW!.

You may wonder why two (2) National events in one calendar year, well remember COVID and the Western Australian lockout, that resulted in the then WA National Conference being postponed many times, those postponements caused the IHEA conference schedule to drift out of sync with our constitution and financial planning strategy. This extra ordinary move is designed to bring all of the IHEA conferences back into line. There is a risk holding multiple conferences in one year but a risk we have to take. Western Australians are renowned for coming together to overcome a challenge.

The Western Australian Executive have taken this responsibility on board with gusto, however what is usually planned over an 18 month period has to be condensed into 9 months, so our focus has been temporarily redirected. But we are gaining momentum and we are now returning back to offering our members the quality events they have come to expect.

Now for something completely different our November "Conference" will be a "Symposium" titled "Healthcare Facility Management - Collaboration by Design. Advancing Healthcare Together". We intend on inviting Subject Matter Experts from every health care genre our Facility Managers interact with to



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Addressing the Tour

deliver papers about who they are, what they have to provide, the challenges they face and how we as Facility Managers can assist them and they assist us. The desired objectives arising from the symposium is a clearer understanding of each other's challenges, the expectations we need to meet in providing a world class health system and hopefully a greater cooperative future. This is your opportunity to be a part of changing the future of Western Australian Healthcare Facility Management.

Speaking of changes within healthcare facility management, the WA Department of Health's Licensing, Accreditation and Regulatory Unit (LARU), following on from the very successful development and consultation workshops, held a series of meetings to discuss the publishing of the 2025 version of Western Australian Health Facility Guidelines.

State Secretary Mr Zarchary Browne and Mr Steven Delides attended on behalf of the WA IHEA Executive and Committee. Zachary submitted his synopsis of the meeting, apologies to both Zachary and the LARU team if I have missed any details.

The meeting was chaired by Ms Karen Ziegelaar representing LARU and Mr Stephen Barrett from Norman Disney and Young. The attendees represented a wide cross section of Healthcare Consultants, Architects, Designers, Facility Managers as well as interested parties from LARU and the WA Department of Health.

The meetings provided a high level overview of the updated guidelines focussing on intent, philosophy and future application rather than on the more technical changes. The key objective of the updated guideline is to promote a shift from a rule book to a principle based perspective. What is significant with this new approach is the ongoing engagement with healthcare projects via the existing processes, the opening of the communication lines, the acknowledgement that there will be design non conformances and the management thereof and finally the introduction of continued guidance

Our thanks must go to the LARU team for continuing with their innovative, cooperative and collaborative approach. LARU has agreed to be a part of our Symposium.

In May we will be visiting Fosters Services new head-quarters to be enlightened by Alex and his team. The theme will be EV charging, an apt topic given the current cost of fuel.

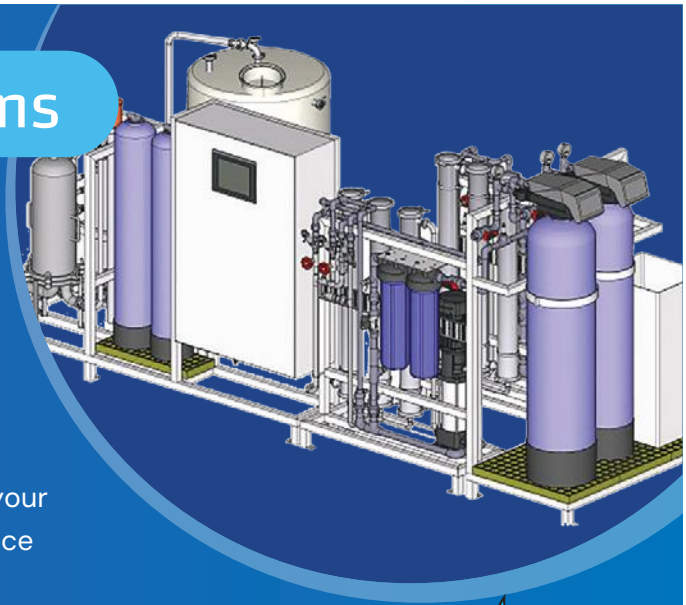
There are other events in the pipeline and as they become confirmed the information will be released via the IHEA web page, so keep an eye out.

Remember to save the date November 16 to 18 for our symposium.

Kindest regards
Frederick Foley
Vice President

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Back in early December, a major hospital in Brisbane faced a serious issue when part of its permanent chiller system failed during peak summer demand. With temperatures above 30°C and limited backup capacity, critical areas like operating theatres and emergency services were immediately at risk.

The remaining system couldn't maintain the required environmental conditions, creating a high-pressure situation that required a fast, practical solution to protect patient care and operations.

EVALUATION & ENGINEERING SOLUTION

Aircon Rentals responded quickly, working with the hospital team and a mechanical engineering contractor to assess the situation. The main challenge was access.

The plant room was located inside the building, with tight entry points and minimal clearance. External air-cooled options were explored; however, long pipe runs and installation constraints made this approach unsuitable.

The solution was to install temporary water-cooled chillers inside the plant room, using existing infrastructure. A carefully planned method was developed to manoeuvre the equipment through narrow access points and position it within a confined space.

This approach avoided major modifications, kept electrical requirements manageable, and minimised disruption.

DEPLOYMENT AND INSTALLATION

Installation was carried out under tight time constraints while allowing the hospital to remain operational.

Equipment was delivered using specialised transport and moved through internal service corridors. The units were positioned inside the plant room and connected using Victaulic pipework and flexible hoses.

The system was integrated with the hospital's existing pump infrastructure, and installation was completed within a few days despite spatial challenges.

COMMISSIONING AND OPERATION

The system was brought online in approximately 1.5 days. It provided stable cooling across critical areas, ensuring essential functions continued without interruption. A staged approach was used, with an initial 1.4 MW followed by an additional ~1.6 MW, bringing total capacity to approximately 3 MW. Remote monitoring ensured consistent performance and reliability.

COMMISSIONING & OPERATION

The temporary system remained in place for more than 20 weeks while the hospital progressed with upgrades to its permanent infrastructure. As those upgrades are completed, the temporary equipment is being removed in stages, ensuring a smooth transition back to the permanent system without affecting operations.

SUMMARY

This project highlights the importance of a fast, well-considered response in a high-risk environment. By adapting the engineering approach and acting quickly, a reliable cooling solution was delivered when needed most. The hospital maintained full operations throughout peak summer with no disruption to critical services.

Project Highlights

- Initial assessment and solution delivered within **24 hours**
- **~3 MW temporary water-cooled chiller** system delivered in stages
- Complex internal plant room installation with restricted access and minimal clearance
- System fully **operational within ~1.5 days** from installation
- **Real-time remote monitoring** ensuring consistent system performance
- **20+ weeks of continuous cooling** supporting critical hospital areas
- **No disruption** to critical hospital services

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Queensland

ANOTHER JOURNAL AND time for another attempt by me to say something original about the time of year. In Queensland it is a great time of year, normally not too wet, the humidity has dropped, and the temperature is mild (at least in SEQ). Swimming is optional though we are approaching the time of year when visitors from south of the border are starting to arrive to enjoy the "warmer" water. Next year will hopefully bring a new Queensland president which will bring you relief from my attempts.

Across Australia, the cost of living continues to be a burning issue and recent world events impacting the price of fuel have only exasperated this. This is a timely reminder of the need to make our facilities resilient to changing external influences. A decade ago, it was all about converting to gas due to the impacts of cost and environmental concerns of electricity generation, but this has shifted with the increased cost of gas and the changing makeup of how electricity is generated on the grid now driving the push for the electrification of facilities. Similarly, it is also seeing fuel alternatives for our backup generators starting to gain traction. Are waterless toilets still a thing? Whilst health engineering has traditionally been conservative with the implementation of tested and trusted technologies, we are increasingly being called to be innovative and be on the leading edge when we can.

The big news for the Queensland COM was surviving the planning for the National Conference and the great event it turned out to be. Having the conference at Seaworld was very popular, the onsite accommodation sold out very quickly (a first for the conferences), the tech tours were informative and interesting, and the presentations met the brief for the theme (Managing Health Infrastructure Risk - Innovation, People, Process and Technology). The conference also saw the introduction of the Women's breakfast (we relocated to the main auditorium due to numbers) and the technology presentations held during the breaks.

We are still to undertake the deep dive on any lessons learnt (there are always things we can improve) from the conference but generally the informal feedback we have received has been very positive. I was disappointed though that when I turned up in shorts for the first day of plenary sessions, I was only one of about three attendees to take this option up (implied option). The conference dinner was also a lot of fun, though the security guards who were escorting us back to the entrance (in the rain) were a bit concerned about the shenanigans of some of our more spirited companions. Luckily no penguins were abducted to be brought home as pets for the kids.



















2026 Queensland Program

With the National Conference behind us (a big thank you to the Iceberg team, Vanessa and Nic for all their hard work) the Queensland COM is finalising the program for the remainder of 2026. Please keep an eye out for email updates about the afternoon PD in late July (at which our Annual Special meeting will be held) and our Christmas breakup and afternoon PD in late November. The COM is also very conscious of the SEQ centric focus of our events - we are hoping to squeeze in a regional event as well.

Committee of Management (COM)

A big ongoing thankyou to Queensland COM for sharing the load in organizing and planning all our events. We are always looking for more volunteers.

President	Danny Tincknell
Vice President	Linda Jordinson
Treasurer	Michael Ward
Secretary	Josiah Padgett
State National Board Representative	Nic Coffey
COM member	Christopher Aynsley-Hartwell
COM member	Mark Fasiolo
COM member	Mark Collen
COM member	Adrian Duff
COM member	Liam Duller
COM member	Michael Campbell

If you would like to communicate with the QLD Branch via email, please do so at ihea.qld@ihea.org.au . We greatly appreciate all feedback on our events and welcome any ideas for topics that you are especially interested in. Let's make the successful national conference a springboard for new and exciting activities.

It was great to catch up with everyone at the National Conference and we hope to see you at our afternoon PD's in the remainder of 2026. A reminder also of the IHEA National Symposium being held in Western Australia on 16-18 November.

Happy Autumn

Danny Tincknell
President, QLD Committee of Management

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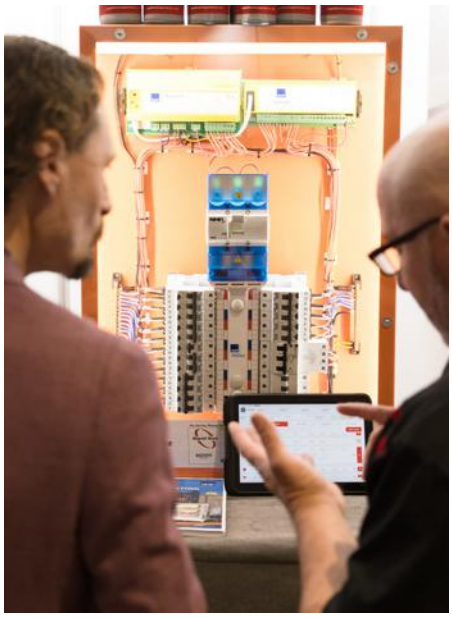
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A Brief Conversation with Shyam Rozare

Western Australian Hospitals like all, are intriguing places, they are complex structures, a hive of activity for 24 hours of every day, year in and year out and all to provide the intricate care necessary to return our patients to the very best of health. Hospitals do not operate on their own, they need dedicated passionate people to carry the burden of such responsibility. Nearly all of our patients and visitors only see our frontline staff, the clinicians and nursing staff as the face of the hospital and rightly so, as these gifted and dedicated people deserve the accolades they receive.



Shyam Rozare

I want to tell you about another equally gifted and dedicated healthcare professional and that person is the Hospital Engineer. I want to introduce you to one such person, his name is Shyam Rozare, and he is the Director of Facilities Management for North Metropolitan Health Services (NMHS). Shyam oversees the Infrastructure Asset Management required to keep four large multi disciplined public hospitals operating.

I had the privilege of working alongside Shyam during my final years before retiring however due to his workload and work ethic there was never time to get to know the real Shyam, oh there were snippets of insight such as when Shyam was telling me about his chickens, but they are another story. So, who is Shyam Rozare?

Shyam was born in Calcutta India into a military family. Shyam's father was in the Indian Navy and because of his postings, Shyam's childhood and schooling took place in a multitude of cities. Some may find this a hindrance, not Shaym! from his nomadic childhood he learned a valued life skill of being able to move and start again. Something that would assist him in his life's journey.

Graduating from year 12, Shyam followed the family tradition and began the process of entering the Indian military. For the want of a better word, fate has a way of guiding one's direction and during his military entrance interview he was asked what he wanted to be and in an instant Shyam replied, "I want to be an Engineer". Like most of the engineers, Shyam has a fascination with technology and the ingenuity of humankind. He saw a world of technology of which he wanted to be a part of. Shyam says he was good at engineering principles, a skill that saw him able to graduate in 1999 with a Bachelor of Mechanical Engineering.

Shyam's initial ambition was to enter the motor vehicle manufacturing industry, a task to satisfy his lifelong love of cars. However, like the rest of us Shyam's ambition didn't quite materialise, and he ended up going to sea as a Marine Engineer. After nearly 9 years travelling the world onboard oil tankers, Shyam returned to dry land, to build ships in Korea and China.

How does one go from Asia to Nedlands Western Australia? Well, Shyam was in Melbourne studying for his Masters in Material Science and whilst taking a well earned sabbatical following the birth of his first daughter a close family friend came to visit. Now that friend was a Shift Engineer at Sir Charles Gairdner Hospital (aka Queen Elizabeth Medical Centre) who casually mentioned the opportunities, challenges and career satisfaction of being a healthcare shift engineer. Shyam and his family moved to Western Australia thinking this would be a short term career building experience. That was in 2012.

Shyam, like everyone who enters health facility management, initially struggled with the uniqueness of working within a hospital, however over a short time and

with the assistance and guidance of his colleagues Shyam began to see the attraction of working in health and the satisfaction of contributing back to the community. Shyam humbly recognises that his transition from the maritime world into health was due to the patience and diligence of a lot of people; however he is especially indebted to the mentorship of former NMHS Director of Facilities Management Mr Peter Easson, retired NMHS Electrical Technical Officer Mr Peter Sargeant, NMHS Acting Area Manager Facilities Operations Mr Raj Trivedi and retired colleague Mr Shaun Ensor. His mentors encouraged him to get involved in the major health development projects of the day and as time flew by he realised that there was still more and his mentors redirected his focus to healthcare facility management.

I asked Shyam "What does the future look like?", and if he had the opportunity what would he change? He replied that the future for Health Facility Management is looking great with significant investments in health infrastructure, systems, and new technologies. If he had the opportunity, it would be to introduce modern technologies into his department to reduce the human burden and to improve service delivery outcomes. One such outcome is the industry focus on sustainability. Health facilities are notorious resource consumers and introducing sustainability whilst maintaining the need for high quality high demand service delivery is not a simple equation. Shyam is an avid supporter of sustainable initiatives and to this end his facility management team was awarded the Green Champion of the Year for 2025. Shyam is very proud of his team in gaining this recognition and took great pleasure in pointing it out to me.

Working in Health Facility Management at any level, but especially as a senior executive can be all consuming. Shyam commented about the stresses that are inherent with the role and how it can be difficult to balance family and work. Shyam credits his work successes to his wife Preeti Verma and in his words "she picks up all of the stuff I cannot for the family". It is a truism that success is not by a single effort. Shyam also said that he tries to maintain a stable working schedule and whilst behind the desk endeavours to leverage the skills and experiences of his team to distribute the load.

I asked Shyam the age old question of "What keeps him up at night?". His response to this was that he finds this question to be counter intuitive as it has evolved to refer to a negative connotation. He opts to a more positive outlook and



The Converted Green Champion Award

that is "What gets me up in the morning?" so I asked… He said that the prospect of working another day in health facility management, doing what he does and working alongside the team to resolve the many challenges each day in health brings is the driving force that gets Shyam motivated each day. I think all hospital engineers can relate to this philosophy.

I asked Shyam "What do you do when you are not at work?" His reply was short and simple. He cooks for his family and he gardens. He does make a mean curry. Oh! as for the chickens? Well, due to the inevitable changes in Shyam's family dynamics they had to be relocated to another family where they are living out their lives with all of the love and care they have come to enjoy.

In spite of the pressures that come with being a Director of Healthcare Facilities Management Shyam has never lost the notion that he leads a team of likeminded people serving and supporting a community dedicated to providing care to those less fortunate.

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Frederick Foley

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Sustainable Solutions for Pandemic and Bushfire Resilience in Healthcare Facilities

Ben Gill
PLASMA SHIELD

A research project at Echuca Regional Hospital demonstrated a significant advance in sustainable and resilient air conditioning for the Australian healthcare sector, showing that indoor air quality (IAQ) can be improved while reducing energy use and emissions.

Funded by the RACE for 2030 Cooperative Research Centre (CRC) and led by the University of South Australia in partnership with Plasma Shield Ltd and Echuca Regional Health, the project evaluated whether hospitals could maintain high IAQ during bushfire events and normal operation without relying on energy-intensive outdoor air ventilation.

Improving IAQ and resilience to pandemics and bushfire smoke has long been a priority in healthcare, but progress has been constrained by cost, energy use, and emissions. Strict regulatory requirements, including AusHFG and AS 1668.2, further reinforce reliance on outdoor air. While 100% outdoor air supports infection control, it introduces gaseous pollutants, fine particles, and moisture-related risks such as mould. Bushfire smoke complicates this approach, as maintaining outdoor air intake during prolonged events is impractical, and carbon filtration has limitations.

ASHRAE 241:2023 recognises Equivalent Clean Air (ECA) as an alternative. The Echuca trial evaluated three stages—100% outdoor air with and without heat recovery (Stage I, Stage II), and a hybrid system (33% outdoor air, 67% ECA) Stage III to assess air quality and energy performance.

Results Summary

The first phase of the field trial was conducted over 45 days, during which approximately 1.8 million data points were collected from the intervention AHU (AHU-02), reference AHU (AHU-03), and occupied space.

Fine and Coarse Particles

Figure 1 shows that downstream of the filtration system in the AHU-02, particle number concentrations fluctuated during Stage I and Stage II, with slightly lower averages in Stage II due to removal of the heat recovery wheel and associated leakage pathways. In Stage III, particle concentrations downstream of the filter remained consistently near zero, with minimal variation despite changes in environmental conditions and upstream loads.

Figure 2 shows the average filter penetration rate for particles in the 0.3–25 µm range for the AHU-02 and AHU-03, both located in the same plant room. AHU-03, with comparable capacity, operated with a filtration configuration equivalent to Stage I of AHU-02 and remained unchanged throughout all stages.

Ultrafine particles

Ultrafine particles (UFPs; 20–100 nm) are a sensitive indicator of outdoor pollution, including bushfires, traffic emissions, and other combustion sources. They are of particular health concern due to their ability to penetrate deep into the respiratory tract and enter the bloodstream, where they are linked to cardiovascular and inflammatory effects. Figure 3 shows ultrafine particle filter penetration across all stages.

Airborne Mould in the Environment

Figure 4 presents the results of the settled fungal assessment conducted within the interventional environment



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(Medical Ward) served by the interventional AHU, using three culture media: Sabouraud dextrose agar (SDA), DG18 agar, and nutrient agar (NA).

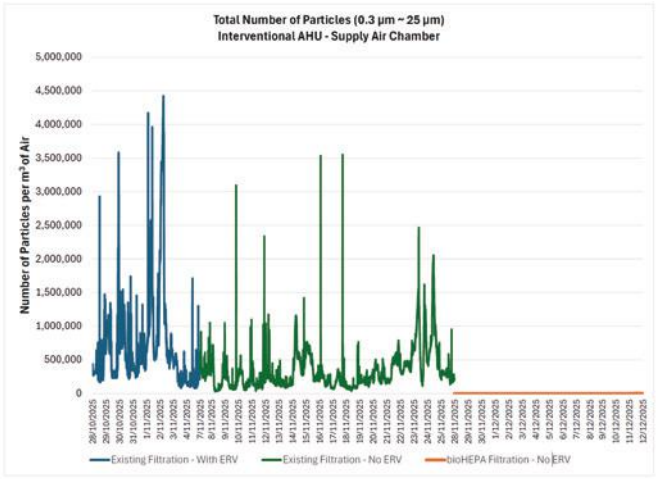


Figure 1: Number Concentration of Fine and Coarse Particles Downstream of the Interventional AHU Filter Across All Stages

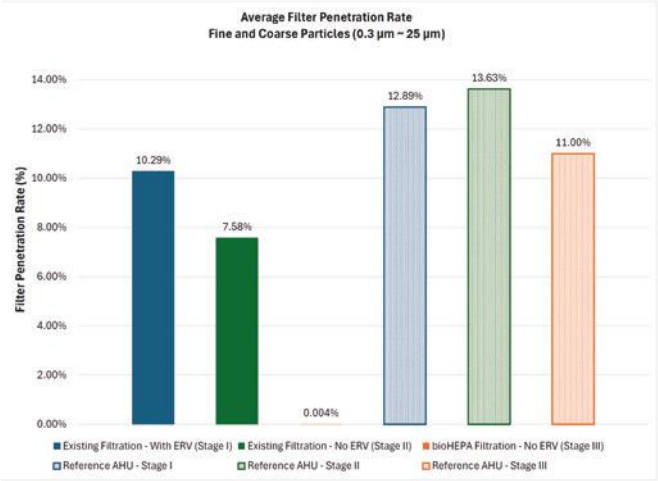


Figure 2: Average Filter Penetration Rate

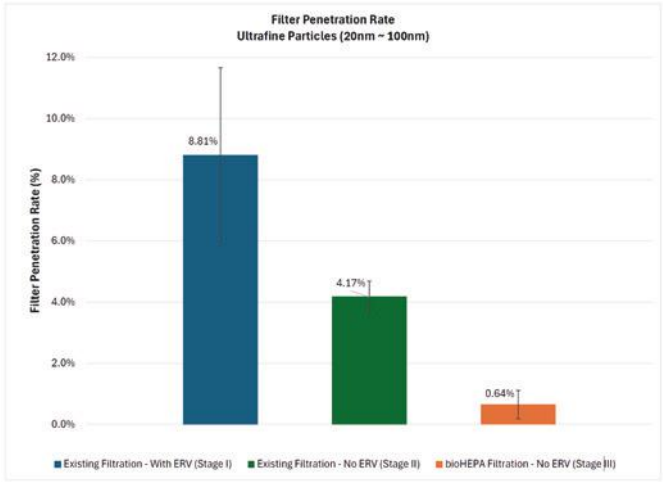


Figure 3: Filter Penetration Rate – Ultrafine Particles

Ozone

Standards bodies recognise outdoor ozone as a contaminant of concern and advise reducing its entry into occupied spaces when feasible. Figure 5 presents the average ozone concentration measured downstream of the filters in the interventional AHU supply air across all stages.

Indoor Carbon Dioxide (CO_2) Levels

In healthcare facilities, CO_2 levels remain low due to mandated ventilation requirements, regardless of filtration or IAQ conditions. Average return air CO_2 stayed below 500 ppm across all stages for both AHUs.

Bushfire Smoke

The Country Fire Authority (CFA) reported several uncontrolled bushfire incidents within a 100 km radius of Echuca Regional Hospital between 12 and 15 January 2026.

As shown in Figure 7, the number concentration of submicron particles in the supply air downstream of the

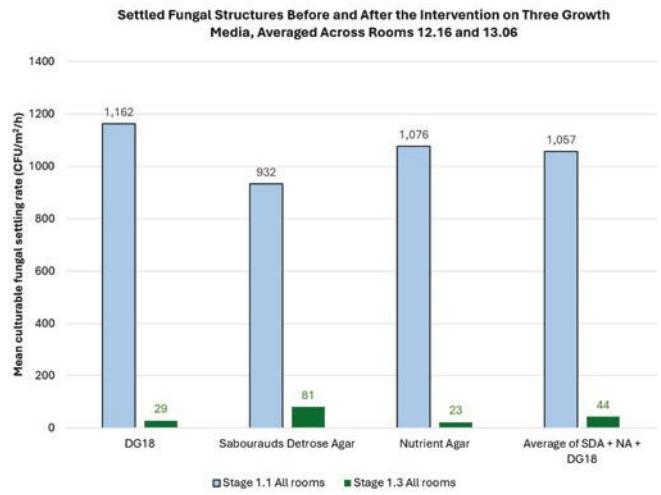


Figure 4: Settled Fungal Structure Before and After the Intervention

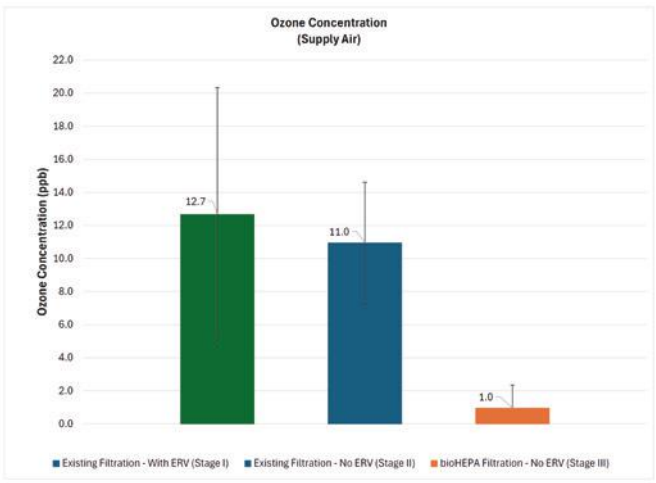


Figure 5: Ozone concentration downstream of filters

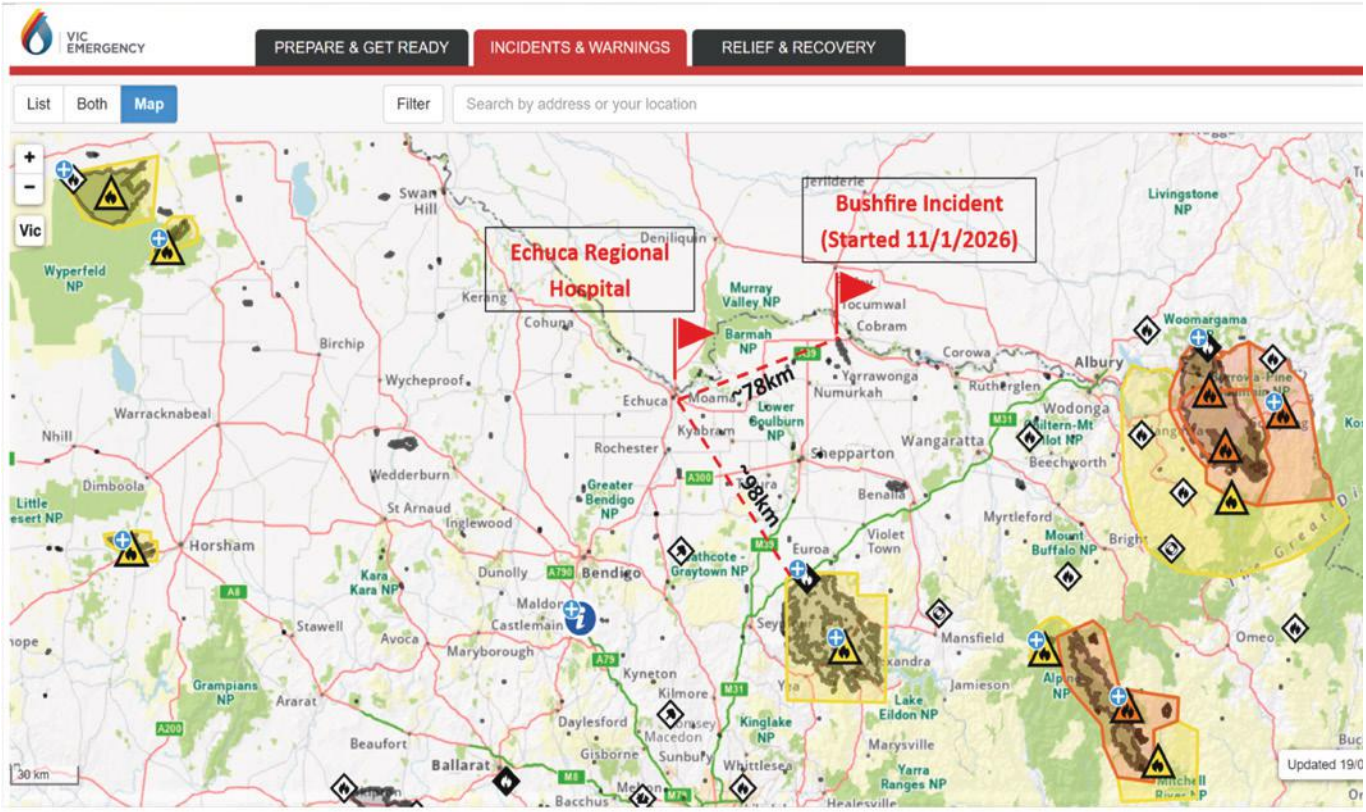


Figure 6: Bushfire map - CFA
These bushfires resulted in up to a 30-fold increase in particle number concentration upstream of the AHU filters.

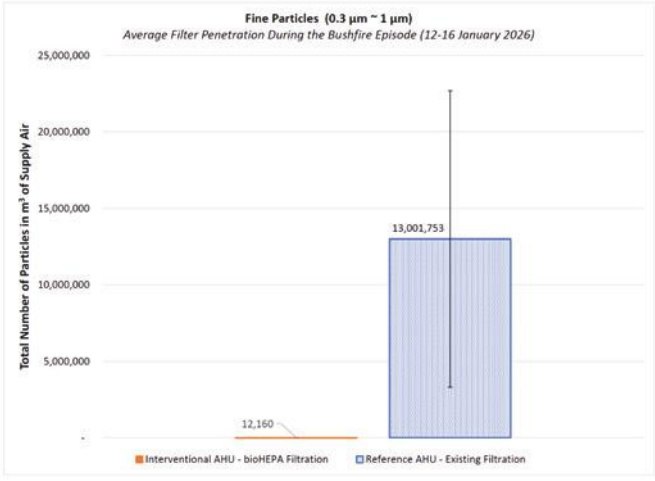


Figure 7: Supply Air Submicron Particle Number Concentration During the Bushfire Episode (12–16 January 2026)

filter in the interventional AHU was approximately 1,000 times lower than the upstream particle concentration measured in the reference AHU for the duration of the bushfire episode.

Conclusion

This interventional field trial demonstrated that air quality in healthcare ventilation systems is strongly influenced by both ventilation strategy and filtration performance. Reducing outdoor air intake lowered exposure to outdoor-derived particulates and biological aerosols but did not fully address variability or transient contamination events.

Removal of the heat recovery wheel reduced particle carryover and leakage; however, it increased energy demand and is not suitable for routine operation.

Installation of the bioHEPA filtration system delivered consistently high and stable removal of fine, ultrafine, and biological particles, including mould spores, independent of outdoor air quality, environmental conditions, or prolonged bushfire smoke exposure. Performance remained stable during high-load events, with particle removal efficiencies approaching 99.98% during multi-day bushfire episodes and complete removal of detectable mould structures.

BioHEPA also reduced mould settling in the ward by 92.7%, from over 1,000 to 44 CFU/m²/h, significantly lowering contamination risks to surfaces, equipment, staff, and patients.

Overall, the findings show that infection control can be maintained without continuous 100% outdoor air operation, consistent with ASHRAE 241 and its Equivalent Clean Air (ECAi) framework. At the same time, protection against bushfire smoke was achieved through a multimodal system managing both particulate and gaseous pollutants.

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Building a Sustainability Culture in Healthcare Facilities

Ramsey Awad

How NSW Public Works partnered with Hunter New England Local Health District to design and implement a whole-of-system sustainability transformation

Executive Foreword

Healthcare systems operate at the intersection of human health, environmental stewardship, and public value. In large, complex, 24/7 health services, sustainability is no longer an optional extra, it is fundamental to resilient care delivery, fiscal responsibility, and long-term community wellbeing.

This white paper documents the collaborative journey between NSW Public Works (NSWPW) and Hunter New England Local Health District (HNELHD) to co-design and implement a whole-of-system sustainability transformation. Together, the organisations moved beyond isolated environmental projects to embed sustainability into governance, clinical practice, capital delivery, procurement, data systems, and organisational culture. What began as an ambitious commitment to be carbon and waste neutral by 2030, has evolved into a disciplined, scalable operating model that is delivering measurable environmental, financial, and social outcomes across one of the largest and most complex health districts in Australia.

Importantly, this transformation did not occur through mandate alone. It was enabled through partnership: combining HNELHD's clinical leadership, operational insight, and community responsibility with NSW Public Works' systems thinking, delivery assurance, commercial capability, and infrastructure expertise. The result is a model that is practical, credible, and replicable across the health sector.

This paper is intended for health leaders, infrastructure agencies, policymakers, and practitioners seeking to understand how sustainability can be operationalised at scale through co-design, shared accountability, and disciplined delivery.

Context: Why Sustainability Became Core Business

Hunter New England Local Health District serves metropolitan, rural, and remote communities across the Hunter, New England, and Lower Mid North Coast regions of NSW, spanning more than 130,000 square kilometres, an area comparable in size to England.

The district operates 28 hospitals and more than 40 community health facilities, supported by a workforce of over 23,000 staff delivering care to more than one



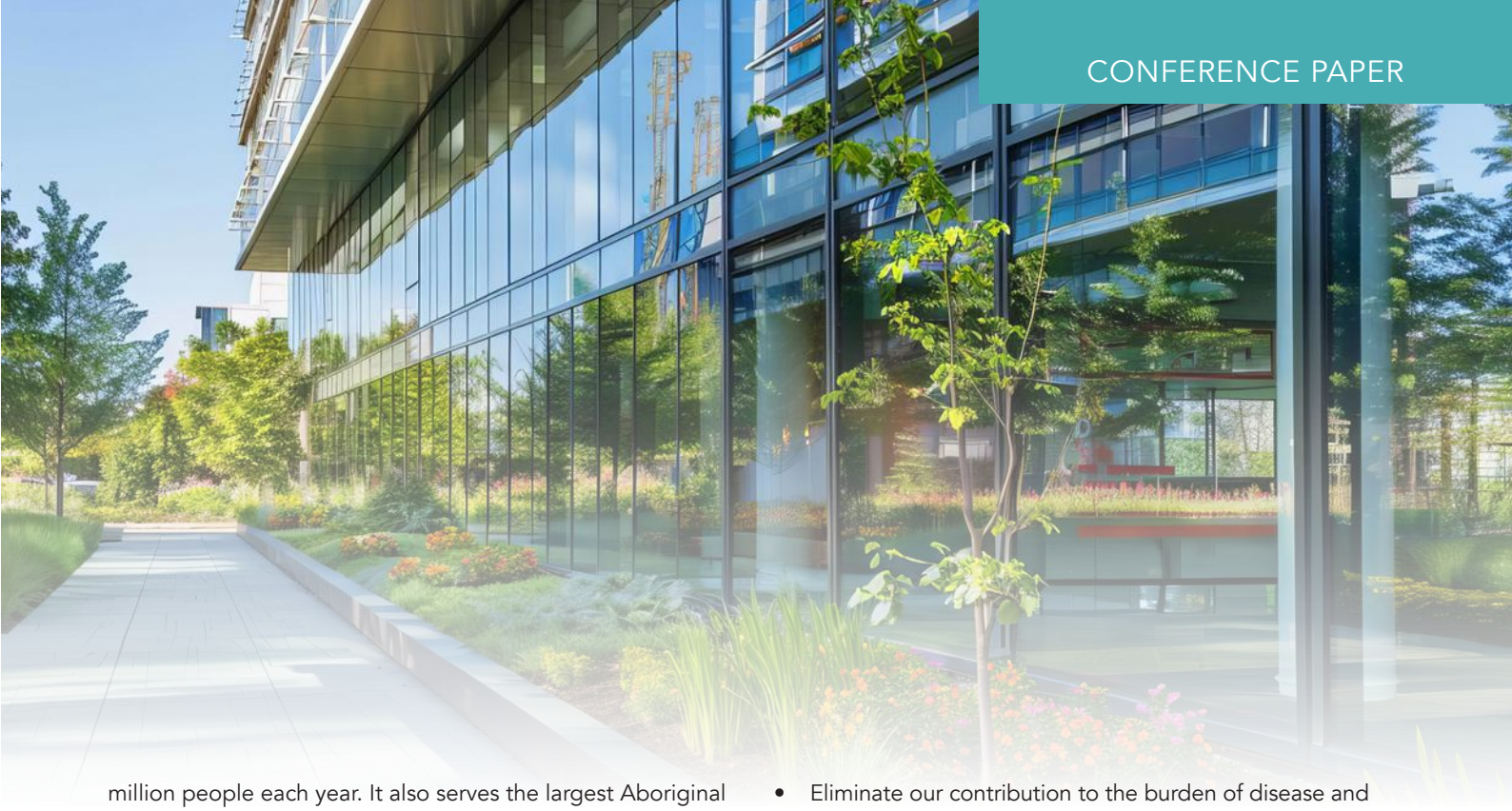
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million people each year. It also serves the largest Aboriginal and Torres Strait Islander population of any Local Health District in NSW.

Climate change is no longer a future risk for this region, it is a present and growing determinant of health. Increasing temperatures, heatwaves, drought, bushfires, and extreme weather events place sustained pressure on emergency services, infrastructure resilience, supply chains, and vulnerable populations. At the same time, healthcare itself is emissions-intensive. Nationally, healthcare contributes approximately 7% of Australia's total greenhouse gas emissions, driven by energy-intensive facilities, clinical consumables, pharmaceuticals, transport, and complex supply chains.

For HNELHD, this reality created both a responsibility and an opportunity to reduce its own environmental footprint while strengthening system resilience, improving operational efficiency, and delivering better value for patients and communities.

NSW Public Works entered this challenge not as an infrastructure provider, but as a delivery partner. Our role was to help translate ambition into action, bringing expertise in governance, assurance, procurement, asset management, and systems integration to support HNELHD in embedding sustainability as core business rather than a parallel program.

A Shared Vision and Co-Design Principles

From the outset, HNELHD and NSW Public Works were clear that sustainability transformation in healthcare must be developed collaboratively and grounded in clinical relevance. Together, they committed to designing not only individual initiatives, but the operating model required to sustain long-term change.

Early executive alignment and cross-functional workshops established a shared vision grounded in five principles:

- Acknowledge and advocate the connection between human health and the environment
- Eliminate our contribution to the burden of disease and work towards reducing our environmental impact while being fiscally responsible
- Adopt Aboriginal stewardship values for our environment and Caring for Country.
- Engage and empower our staff and community to participate in this journey of sustainability transformation.
- Contribute to leading a movement of sustainability.

This shared framing shifted sustainability from an environmental compliance exercise to a core enabler of resilient, high-quality healthcare.

From Strategy to Delivery: A Whole-of-System Framework

To operationalise this vision, HNELHD and NSW Public Works adopted and embedded a nine-element foundation framework that now underpins sustainability action across the district:

- **Present a compelling case for change**, linking sustainability to health outcomes, risk management, compliance obligations, and total cost of ownership.
- **Establish clear goals and staged targets**, aligned to a credible pathway to net zero emissions and waste neutrality by 2030.
- **Set performance measures and targets** across energy, emissions, water, waste, transport, and procurement.
- **Collect, manage, and report data** through integrated dashboards and energy management systems.
- **Establish governance and accountability** from Board-level oversight to facility-based champion groups.
- **Reward and promote excellence** to reinforce desired behaviours and accelerate adoption.
- **Build communities of interest** across clinical, operational, and infrastructure teams.
- **Manage and share knowledge** through playbooks, case studies, and communities of practice.

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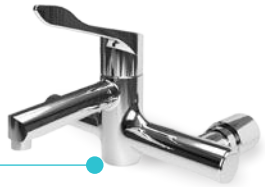
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- **Provide leadership, resourcing, and innovation** to unlock scale and replication.

These foundations connected strategic ambition with day-to-day operational change between strategy, capital investment, operational change, and cultural engagement. NSW Public Works played a key role in translating the framework into practical delivery mechanisms embedding sustainability requirements into business cases, design briefs, procurement pathways, and project assurance processes.

Governance and Operating Model: Enabling Accountability at Scale

HNELHD established a layered governance structure to ensure sustainability was embedded at every organisational level. This includes Board oversight through sustainability sub-committees, executive sponsorship, district-wide working groups, hospital-level committees, and clinical reference groups.

NSW Public Works supported this model by integrating sustainability into existing delivery systems rather than creating parallel processes. This included:

- Embedding sustainability criteria into capital project gateways and assurance reviews.
- Standardising sustainability requirements within design briefs and technical standards.
- Aligning procurement and commercial strategies with emissions, waste, and lifecycle cost objectives.
- Providing benchmarking, assurance, and independent challenge to support informed decision-making.

To drive change a critical enabler was resourcing in the clinical space. Through the NSW Health Net Zero Lead program, HNELHD established dedicated clinical sustainability roles within Surgical Services, Allied Health, and Imaging. These roles bridged the gap between corporate strategy and frontline practice, ensuring initiatives were clinically feasible, trusted, and embedded into day-to-day care rather than perceived as external impositions.

Data, Transparency, and Trust

Credible data underpinned the entire transformation. With support from NSW Public Works and specialist advisors, HNELHD established a comprehensive greenhouse gas emissions baseline in 2020 covering Scope 1, Scope 2, and material Scope 3 sources. With the baseline identified as 105,000 tonnes in CO_2 emissions.

By 2024, reported emissions had reduced to approximately 72,653 tonnes of CO_2 emissions, representing a reduction of around 31% from the baseline. This progress was achieved alongside growth in service demand, underscoring the effectiveness of system-level interventions rather than reliance on offsets alone.

HNELHD also established quantified targets across water and waste streams, including:

- 100% rainwater capture and reuse where feasible by 2030.
- 50% of water recycled and reused by 2030.
- Zero waste to landfill as a long-term objective, with significant interim reductions already achieved.

Purpose-built sustainability dashboards now provide near real-time visibility of emissions, energy use, water consumption, waste generation, and financial savings across the district. These dashboards inform Board reporting, guide site-level decision-making, and enable transparent communication with staff and partners.

By creating a shared evidence base, data became a tool for collaboration rather than compliance, supporting constructive conversations about priorities, trade-offs, and investment decisions.

High-Impact Interventions Delivered Through Partnership

Energy: Efficiency First, Renewables at Scale

Energy efficiency was deliberately prioritised as the first step in emissions reduction. LED lighting upgrades, controls optimisation, and plant improvements delivered fast payback and immediate emissions reductions. By 2024, LED lighting had been installed at 41 of 60 major sites, delivering annual savings of approximately $1.24 million.

Renewable energy deployment followed, with onsite solar systems installed across 80% of sites, representing more than 8.2 MW of installed capacity. These systems deliver annual financial savings of approximately $2.7 million while materially reducing grid-supplied electricity demand.

The most prominent example is the John Hunter Hospital solar installation, recognised at the time of commissioning as the largest solar system in a hospital globally. NSW Public Works played a critical role in technical review, procurement strategy, risk management, and integration within a live clinical environment, ensuring reliability, safety, and performance.

Water: Resilience Through Reuse

Water stewardship emerged as a strategic priority, particularly in drought-prone regions. Across the district, 26 of 56 sites are now equipped with rainwater tanks, providing more than 1.37 million litres of storage capacity.

A flagship initiative is the renal dialysis reverse-osmosis (RO) water recycling program. Of 13 dialysis sites, 5 are now actively recycling RO reject water for non-potable uses such as toilet flushing. The Tamworth Hospital project demonstrates how clinician-led co-design, supported by NSW Public Works engineering and assurance expertise, can deliver infection-safe, cost-effective, and replicable solutions saving millions of litres of potable water annually.

Waste and Circular Resources

HNELHD generates more than 5,400 tonnes of waste annually across its facilities. Through district-wide standardisation and targeted innovation, waste streams have been reduced and diverted from landfill. Four-stream segregation is now standard practice, supported by

site-specific recycling streams for metals, e-waste, organics, and selected clinical plastics.

Partnerships with local manufacturers have enabled circular outcomes transforming clean clinical plastics and end-of-life uniforms into durable products used within health facilities.

A research-led approach to non-sterile glove use ("Gloves Off") has demonstrated how clinical practice change can simultaneously reduce waste, emissions, and costs without compromising infection control.

Transport and Models of Care

Transport emissions were addressed through both fleet transition and service redesign. The district operates a fleet of approximately 900 vehicles, with progressive transition to hybrid and electric vehicles supported by onsite charging infrastructure. Fleet emissions in 2023–24 were approximately 1,987 tonnes of CO2 emissions, with year-on-year reductions achieved through vehicle replacement and utilisation optimisation.

E-bikes have also been introduced as fleet vehicles for short trips, supporting staff mobility while reducing emissions and improving wellbeing. In parallel, sustainability considerations have been embedded into models of care, including telehealth and Hospital in the Home, reducing unnecessary travel and facility demand.

Capital Projects: Designing Sustainability In, Not Bolting It On

Across major redevelopments and precincts, including the John Hunter Health and Innovation Precinct, HNELHD and NSW Public Works embedded sustainability from concept to commissioning. All major projects adopt a minimum 5-Star Green Star target and apply a shared six-pathway framework:

- Built Form
- Energy Generation
- Transport
- Models of Care
- Circular Resources
- Carbon Sinks and Climate Resilience

This framework provides a common language for clinicians, engineers, designers, and project managers, ensuring sustainability outcomes are integral to scope, cost, and risk decisions rather than value-managed out at later stages.

Culture, Capability, and Caring for Country

A critical enabler of this cultural shift has been the HNELHD Sustainability Champions Program. The program engages staff across clinical, operational, and support functions to lead locally relevant sustainability initiatives within their own services. Champions are supported through shared tools, practical guidance, and communities of practice, enabling ideas to be tested, adapted, and scaled across sites. By empowering staff closest to care delivery to identify opportunities and influence everyday decisions, the program has embedded sustainability into routine practice and reinforced it as a shared responsibility rather than a centralised function.

Caring for Country principles are embedded through partnerships with Aboriginal communities and Local Aboriginal Land Councils, influencing land management, landscaping, public art, and engagement practices. These collaborations reinforce sustainability as a cultural commitment grounded in stewardship, respect, and intergenerational responsibility.

Outcomes and Value Created

The HNELHD/NSW Public Works partnership has delivered measurable outcomes across environmental, financial, and cultural dimensions, including:

- A 31% reduction in total emissions from the 2020 baseline by 2024.
- More than $3.9 million per year in combined energy savings from efficiency and solar.
- Significant reductions in potable water demand through reuse and rainwater capture.
- Improved waste diversion and circular economy outcomes across more than 45 sites.
- Recurring financial savings redirected to patient care and further sustainability investment.

These outcomes are the compound effect of governance, data, co-design, and sustained delivery, rather than isolated projects.

Lessons for the Sector

Key lessons emerging from the HNELHD/NSW Public Works partnership include:

- **Start with health outcomes**. Sustainability resonates most when framed as safer, more resilient care.
- **Pair governance with capability**. Board oversight must be matched with dedicated clinical and delivery roles.
- **Use data to build trust**. Shared dashboards enable constructive conversations about priorities and trade-offs.
- **Standardise what works**. Replicable playbooks reduce friction and accelerate scale.
- **Co-design beats compliance**. Enduring change is built through partnership, not mandate.

Conclusion

Building a sustainability culture in healthcare is a disciplined, system-level transformation. The partnership between NSW Public Works and Hunter New England Local Health District demonstrates that when infrastructure expertise, clinical leadership, and shared purpose come together, sustainability becomes self-reinforcing delivering healthier environments, stronger resilience, and better value for communities.

This work represents not an endpoint, but the establishment of a durable foundation one that can be adapted, scaled, and shared across the health sector in NSW and beyond.

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Condition Based Data-Driven Approach



Stage 1

Develop Asset Register



Stage 2

Develop Maintenance Strategy



Stage 3

Develop Asset Maintenance Plan



Stage 4

Data Upload Into Information System



Stage 5

Develop Asset Management Plan, CapEx/OpEx

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Lifecycle Cost Modelling: A Data-Driven Approach to Extending the Operational Life of Healthcare Facilities

S Safi (PhD, FIEAust, CPEng, CAMA)
COVARIS

Extending the operational life of hospital facilities requires data-driven assessment and strategic asset management. A multidisciplinary audit was conducted across several hospital buildings to evaluate the condition of infrastructure assets and identify requirements for sustaining operational reliability over extended timelines. The assessment encompassed mechanical, electrical, fire, hydraulic, façade, roofing, ICT, and other critical systems. Historical asset data, on-site inspections, and stakeholder consultations were used to validate asset information, assess asset condition, and identify maintenance, compliance, and safety issues.

An updated asset register of more than 10,000 assets was developed, incorporating newly identified assets and revised condition ratings. A bottom-up lifecycle cost model was subsequently applied to forecast maintenance, refurbishment, replacement costs over a 20-year horizon, as well as the necessary repairs, replacements, or upgrades associated with the recommended remedial actions for the identified issues. The findings establish an evidence-based framework to prioritise maintenance, plan renewals, and optimise lifecycle management, supporting the sustained reliability and resilience of hospital infrastructure.

Introduction

Healthcare facilities rely on the continuous functionality of their physical infrastructure to ensure safe and reliable clinical service delivery. As hospitals age, the need for accurate lifecycle forecasting and proactive asset management becomes increasingly critical. Infrastructure systems - including mechanical, electrical, fire safety, hydraulic networks, ICT infrastructure, building fabric, façade systems, and roofing - must be systematically maintained to mitigate risk, uphold compliance, and avoid disruption to essential healthcare operations.

This paper presents a comprehensive, data-driven methodology for extending the operational life of hospital facilities. Through a detailed audit, validation of asset information, asset condition assessment, and bottom-up cost modelling, the approach provides healthcare organisations with reliable forecasts of long-term maintenance and renewal needs, and addresses identified issues across the facility.

Cost Modelling Methodology

Using data from the site audit, a bottom-up Asset Lifecycle and Maintenance Cost Model was developed. The model is built by calculating maintenance and lifecycle costs for the validated asset register, followed by estimating the cost of proposed works to address chronic issues identified through site visits, consultation with the hospital's asset management team, and reviews of prior condition assessments.

Figure 1 summarises the model's cost categories:

1. Preventative Maintenance
2. Corrective Maintenance
3. Asset Replacement

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4. Asset Refurbishments
5. Corrective Actions for Remediation of Known Issues. 2 shows the process for calculating cost components 1 to 4.

Asset Register and Asset Classification Reference Date

The first step in the cost modelling of a healthcare facility is to identify the list of assets which is used for the bottom-up modelling approach. The required asset data are:

1. Asset Details: asset id, asset name, asset classification as a minimum plus additional asset details if available (e.g., manufacturer name, model number …);
2. Asset Lifecycle Details: in service date, purchase cost / replacement value; and
3. Asset Condition Assessment (if available): observation date, Condition Rating, Current Usage, Operating Environment, Criticality. If asset conditions were not available, asset condition was assigned based on the age of the facility.

An asset reference data library is required for building and facility assets to enable the modelling of maintenance costs for healthcare facilities. The reference data have been developed for all asset classifications used in the hospital's asset register. This information drives the calculation of maintenance costs and includes the following:

1. Identifying the maintenance strategy for assets with applicable asset classifications. All assets will be identified as requiring planned maintenance or unplanned maintenance.
2. Price Book: This important reference data provides the current replacement value for assets. If the healthcare facility asset register has accurate purchase cost/ replacement value, these values will be used in the



Figure 1 Cost Model Elements

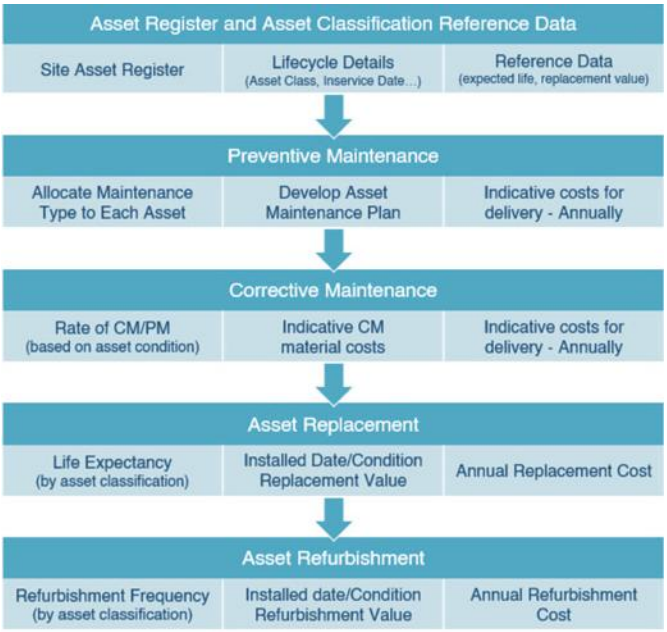


Figure 2 Asset Maintenance and Life Cycle Costs Modelling Process

Asset Classification Name	PM Strategy Name	Life Exp. (yrs)	Refurb. Freq. (yrs)	Refurb. Cost as a % of Replacement Cost	Library Minimum Cost	Library Maximum Cost	Library Average Cost
Chilled Water Pumps	Centrifugal Pump	15	5	25%	$6,118	$19,467	$12,793
Chillers	Screw Chiller	15	10	30%	$25,917	$833,919	$346,858
Cooling Towers	Cooling Tower	20	10	30%	$51,468	$261,000	$172,981
Distribution Boards	Distribution Board	20	10	20%	$7,930	$96,200	$24,175
Goods Lifts	Lift	25	10	20%	$321,103	$403,245	$362,174
Fire Doors	Fire Doors	20	5	5%	$3,018	$8,223	$3,945
Fire Hose Reels	Fire Hose Reel	10	5	20%	$711	$839	$775

Table 1 Sample Asset Reference Data Library

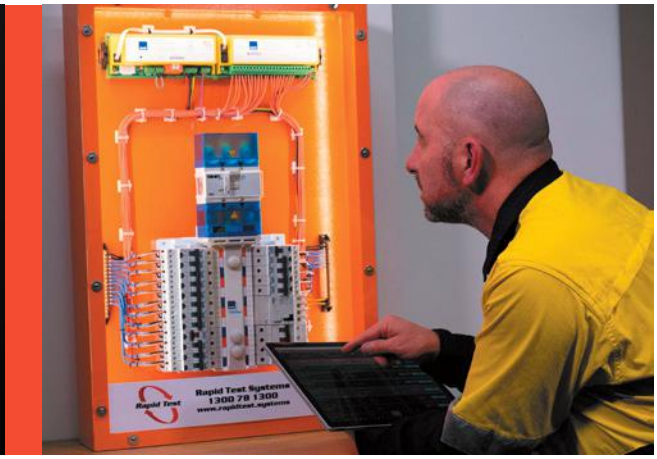


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calculation of refurbishment and replacement costs. If cost data is not available, the average price from the price book for the applicable asset classification will be used.

3. Life Expectancy (years): Provides the expected life by asset classification. Assets will be replaced when they reach the end of their expected life (see Table 1).
4. Planned Refurbishment (years): The expected frequency of the refurbishment by asset classification (see Table 1).
5. Planned Refurbishment (%): The percentage of the asset cost required for the planned refurbishment (see Table 1).

Estimated Cost of Preventative Maintenance

The first cost component in the model is developing the bottom-up budget for preventative maintenance. This includes calculating the preventative maintenance cost for all maintainable assets using the following steps:

1. Allocate Maintenance Type to each asset: At the end of this stage, each asset will have a type of maintenance allocated (planned or unplanned) based on the asset reference data library.
2. Develop Asset Maintenance Plan: This stage involves developing an Asset Maintenance Plan for all assets identified with a planned maintenance type, based on the developed Planned Maintenance Service Plans. The maintenance service plans are aligned with the statutory maintenance requirements for the applicable asset classification. At the end of this stage, the Asset Maintenance Plan developed will contain a detailed maintenance schedule and resource requirements.
3. Indicative Costs for PM Delivery: Develop an annual PM maintenance cost forecast for all assets in the asset register. This includes calculating the annual PM delivery cost based on estimated task duration and the hourly rate of the required resources. PM delivery costs also include work quality checks, administrative support, supervisor oversight, and cost of spare parts.

Expected Cost of Corrective Maintenance

The second cost component in the model is developing the budget for corrective maintenance, which is estimated based on the asset condition across the site using the following steps:

1. Rate of CM/PM: Corrective Maintenance (CM) annual costs are estimated as a percentage of calculated Preventive Maintenance (PM) costs, based on asset condition. *Table 2* shows the remaining life and the ratio for CM costs as a percentage of PM costs based on the asset condition.
   - The CM/PM labour hourly rate is 125% (on average, the hourly rate for corrective work is 25% higher than the preventive work hourly rate).
2. Indicative CM Material Costs: The estimated cost of materials for CM work is estimated at 20% of the CM labour hour costs.
3. Indicative costs for delivery: Develop an annual corrective maintenance cost forecast for all assets in the site-specific asset register. CM delivery costs include trade resource hours, work quality checks, administrative support, supervisor/building manager, and spares cost.

Condition	Remaining Life (%)	CM to PM Ratio (%)
Excellent	95	10
Good	75	44
Fair	50	58
Poor	20	87
Very Poor	5	116

Table 2 Remaining Life and Rate of CM/PM Cost

Life Cycle Replacement

The third cost component in the model is the Life Cycle Replacement cost which is calculated for all assets included in the site-specific asset register based on the following steps:

1. Life Expectancy (years): Expected life of each asset is identified based on the asset classification. The expected life for the applicable asset classification is identified in the asset reference data library.
2. Installed date and Replacement Value: Identify the installed date and asset replacement value from the asset register. If the data is not available, identify the installed date by consulting healthcare facility asset managers or the age of the facility. The replacement value can be estimated based on the asset classification and the replacement value for the applicable asset classification as identified in the asset reference data library. If the healthcare facility asset register has accurate purchase cost/replacement value, these values will be used in the calculation of refurbishment and replacement costs.
3. Annual Replacement Cost: Develop an annual life cycle replacement cost forecast for the life of the assets for the site-specific asset register. For the 25-year Cost Modelling, assets may be replaced multiple times based on their expected life.

Life Cycle Refurbishment

The last cost component in the model is the Life Cycle Refurbishment cost which is calculated for all assets included in the site-specific asset register based on the following steps:

1. Refurbishment Frequency (years): The refurbishment frequency of each asset is identified based on the asset classification as identified in the asset reference data library.
2. Installed date / Refurbishment Value: The installed date is identified from the asset register, if available. If the data is not available, the installed date is identified in

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consultation with healthcare facility asset managers or the age of the facility. The refurbishment value for each asset is a percentage of the replacement value of the asset based on the applicable asset classification as identified in the asset reference data library.

3. Annual Refurbishment Cost: Develop an annual lifecycle refurbishment cost forecast for the site-specific asset register. For the 25-year Cost Modelling, assets may be refurbished multiple times based on their refurbishment frequency.

Remediating Chronic Issues / Upgrade Work

The final component of the cost model involves estimating the cost of proposed works to remediate identified chronic issues and undertake the work required to extend the operational life of the building or facility. These issues are identified through the following activities:

- Building audits to identify non-compliance or other issues
- Workshops with the healthcare facility's asset management team
- Reliability analysis of work order history records from the healthcare facility's Enterprise Asset Management System
- Review of previous condition assessment reports

shows the methodology for developing this cost element. As part of this component, known issues are itemised, and a top-level cost estimate is developed to support budgeting for the specified issues. In addition to the estimated cost to remediate each issue, a priority level and recommended start date are assigned in consultation with the healthcare facility asset management team. An example of this type of work is the remediation of mould in sections of the hospital's HVAC ductwork or upgrades to ICT infrastructure that no longer complies with current standards.

Action Priority

Each identified issue was risk-ranked and assigned a corresponding solution. The priority level of each solution was determined based on the associated risk rating, which in turn established the required timeframe for implementation.

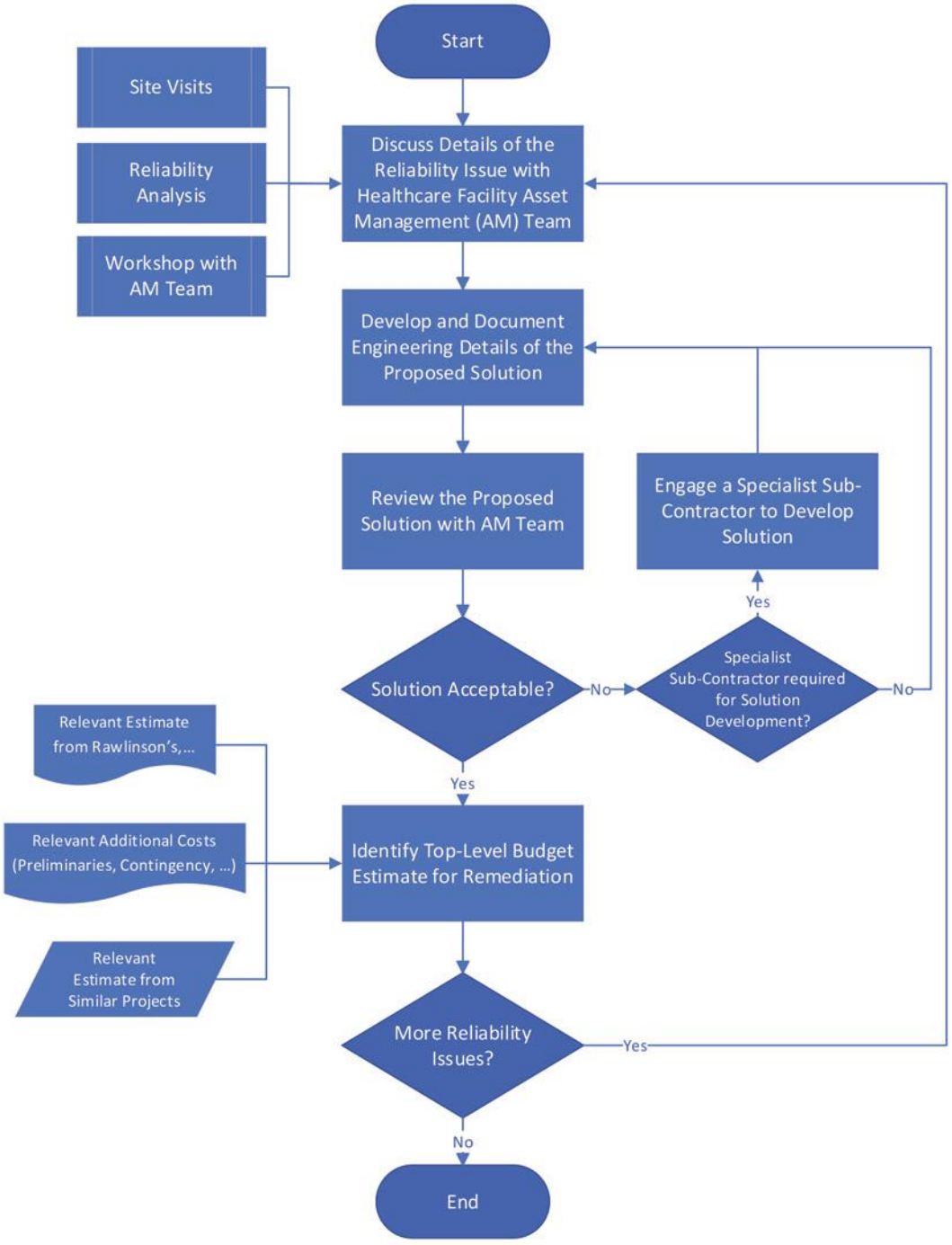


Figure 3 Methodology for Developing Costed Solutions for Chronic Issues

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Risk Rating	Priority Rating	Timeframe	Description
Extreme	1	Immediate	Immediate action required
High	2	1-2 Years	Senior management attention required
Medium	3	3-4 Years	Management responsibility to be specified
Low	4	5-6 Years	Managed by asset management routine maintenance

Table 3 Action Priority Ranking

Overhead Cost Component	Overhead	Project 1 – ICT Infrastructure Upgrade	Project 2 – Cooling Towers Upgrade
	Gross	$2,500,000	$832,500
Preliminaries + supervision	21%	$525,000	$174,825
Margin	5%	$125,000	$41,625
Staging + relocations	2.50%	$62,500	$20,813
Investigation + design	8%	$200,000	$66,600
Insurance	1%	$25,000	$8,325
Statutory fees	1%	$25,000	$8,325
SYD project management	7%	$175,000	$58,275
Commissioning	5%	$125,000	$41,625
ICT	2.50%	$62,500	$20,813
Escalation	2.50%	$62,500	$20,813
Contingency	10%	$250,000	$83,250
Total Project Cost (TPC)	65.5%	$4,137,500	$1,377,788

Table 4 Project Overheads

Project / Year	Total Project Cost	2025-26	2026-27	2027-28	2028-29	2029-30
Project 1 – ICT Infrastructure Upgrade	$4,137,500	$0 (0%)	$34,445 (2.5%)	$413,336 (30%)	$895,562 (65%)	$34,445 (2.5%)
Project 2 – Cooling Towers Upgrade	$1,377,788	$0 (0%)	$103,438 (2.5%)	$1,241,250 (30%)	$2,689,375 (65%)	$103,438 (2.5%)

Table 5 Project Budgets

The definitions for each priority category are provided in table 3 above.

Project Overheads and Project Staging

The lifecycle stages for the major projects are:

- Stage 0 – Plan
- Stage 1 – Develop
- Stage 2 – Prove
- Stage 3 – Procure
- Stage 4 – Implement
- Stage 5 – Measure

Due to the scale of several remediation projects, major works were staged for completion over multiple years. These projects will be delivered over five years to ensure controlled sequencing and minimal operational disruption. The staging for a sample project is outlined below.

- **Year 1 (2026–27):** Plan (Early investigation) and Develop (Feasibility) - 0%
- **Year 2 (2027–28):** Prove (Business case) and Procure (Tender) - 2.5%
- **Year 3 (2028–29):** Implement (Design + Early Construction) - 30%
- **Year 4 (2029–30):** Implement (Main Construction) - 65%
- **Year 5 (2030–31):** Measure (Commissioning) - 2.5%

This five-year funding model provides a structured approach to delivering complex projects while maintaining continuous operation of the healthcare facility. Table 4 provides the

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Year	Preventative Maintenance	Corrective Maintenance	Asset Refurbishment	Asset Replacement	Remediating Work	Grand Total
2026	$1,145,554	$650,923	$537,091	$165,296	$510,602	$3,009,466
2027	$1,145,554	$691,808	$746,302	$459,280	$5,044,230	$8,087,173
2028	$1,145,554	$696,953	$1,288,470	$1,224,740	$11,582,084	$15,937,801
2029	$1,145,554	$738,199	$993,100	$525,641	$4,972,457	$8,374,952
2030	$1,145,554	$797,755	$773,830	$3,143,614	$4,407,846	$10,268,600
2031	$1,145,554	$824,867	$345,418	$153,829	$1,566,190	$4,035,858
2032	$1,145,554	$698,633	$133,494	$6,545,323	$577,565	$9,100,569
2033	$1,145,554	$751,990	$533,039	$79,202	$20,560	$2,530,345
2034	$1,145,554	$775,462	$1,714,637	$685,666		$4,321,319
2035	$1,145,554	$735,199	$544,538	$1,981,708		$4,407,000
2036	$1,145,554	$718,027	$79,367	$3,408,485		$5,351,434
2037	$1,145,554	$770,229	$712,775	$536,265		$3,164,823
2038	$1,145,554	$868,806	$776,965	$10,928,616		$13,719,941
2039	$1,145,554	$857,078	$1,048,712	$492,771		$3,544,116
2040	$1,145,554	$839,598	$616,111	$6,495,171		$9,096,434
2041	$1,145,554	$904,213	$379,976	$122,759		$2,552,502
2042	$1,145,554	$804,281	$432,958	$3,684,572		$6,067,364
2043	$1,145,554	$695,565	$51,644	$5,324,340		$7,217,104
2044	$1,145,554	$727,698	$129,826	$12,851,403		$14,854,481
2045	$1,145,554	$786,403	$795,389	$6,691		$2,734,037
Grand Total	$22,911,080	$15,333,688	$12,633,642	$58,815,373	$28,681,533	$138,375,317
Annual Avg.	$1,145,554	$766,684	$631,682	$2,940,769		$6,918,766

Table 6 Cost Modelling Results for the Sample Hospital

percentage of gross project cost allocated to each overhead cost component.

Table 5 presents the five-year staging for sample projects.

The estimated cost for the ICT Infrastructure Upgrade (Project 1) is $2,000,000–$2,500,000, depending on the compatibility of the existing field devices. The Total Project Cost (TPC), including project overheads, is $4,137,500.

The estimated cost for the Cooling Towers Upgrade (Project 2) is $832,500, based on both units requiring replacement. The Total Project Cost (TPC), including project overheads, is $1,377,788.

Findings

A 20-year Asset Maintenance and Life Cycle Cost Model was developed for the sample hospital. The cost modelling covers the following cost categories:

- Preventative Maintenance
- Corrective Maintenance
- Asset Replacement
- Asset Refurbishments
- Remediating Chronic Issues

The average yearly preventative maintenance cost component for the hospital, based on the bottom-up cost model outlined in Section 2.2, is $1,145,554. This figure includes the preventative maintenance costs for all maintainable assets within the scope of the project.

The average estimated budget for the corrective maintenance cost component for the hospital, based on the bottom-up cost model, is $766,684. The fluctuation in annual corrective maintenance costs over the 20-year period is due to this cost component is a function of both the condition assessment of the assets, carried out as part of the project, and the aging of assets over time. For example, the corrective maintenance cost decreases after an asset is replaced and increases as the asset continues to age throughout its life cycle.

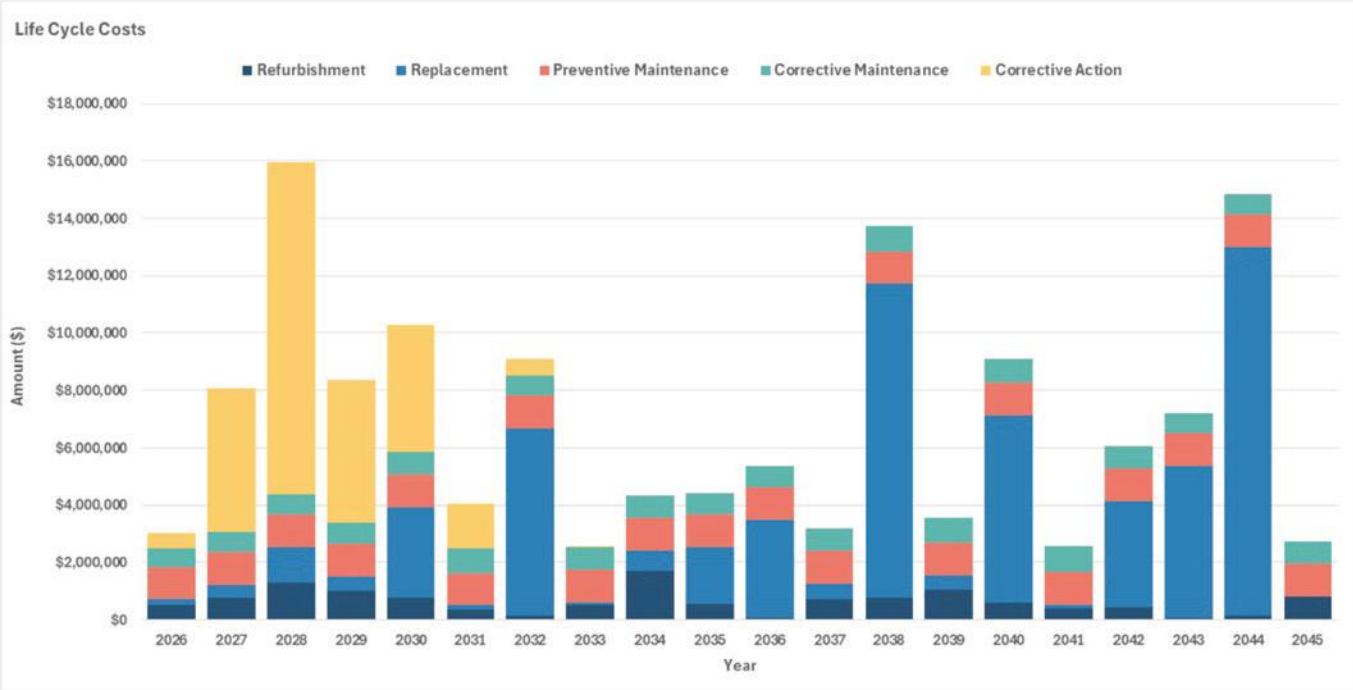


Figure 4 Cost Modelling Results for the Sample Hospital

The total estimated budget for the hospital's asset replacement cost component, based on the bottom-up cost model outlined in Section 2.4, is $58,815,373 over the next 20 years, while the asset refurbishment cost component over the same period is $12,633,642.

Table 6 and Figure 4 present the 20-year lifecycle expenditure from the bottom-up cost model for the sample hospital.

Cost Modelling Limitations

It is important to note that the cost model may underestimates full amount required for maintenance and capital costs of the hospitals for the following reasons:

1. The modelling only covers maintainable building and facility assets recorded in the asset management information system. If assets are not recorded in the asset management information system, the modelling underestimates the required costs across all maintenance categories.
2. The modelling excludes fixtures, fittings, furniture, and equipment.
3. Fleet, food services, and laundry services assets were also excluded from the modelling.
4. Biomedical assets were not included in the modelling.

The cost models exclude the following cost components:

- Replacement of buildings at the end of their useful life.
- Grounds maintenance.
- Soft services.

Conclusions

This paper demonstrates that extending the operational life of healthcare facilities requires a structured, data-driven approach supported by validated asset information and evidence-based lifecycle modelling. The asset audit and subsequent development of an asset register enabled an accurate understanding of the hospital's asset base and its condition. Applying a bottom-up lifecycle cost model provided clear forecasts of preventative and corrective maintenance requirements, asset refurbishment and replacement needs, and the funding necessary to address chronic issues affecting reliability, compliance, and operational performance of the facility.

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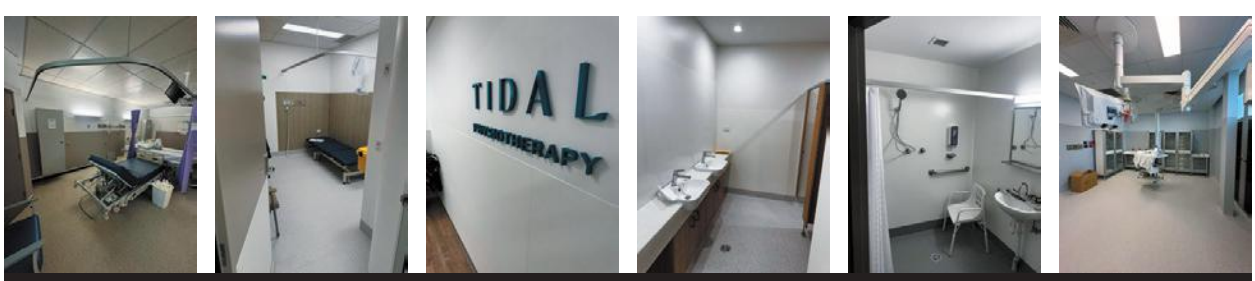
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Queensland Children's Hospital: Innovation in Asset Management through Electrification, AI Optimisation and Pathways to Net Zero

Aaron Liu, Ravi Kolli, Dale Tilley, Cyriac John Mukkada, Michael Campbell

Introduction

Queensland Children's Hospital (QCH) is a major urban hospital located in subtropical Brisbane, Queensland, Australia. It is the only public children hospital in the state of Queensland, providing specialist health services for people in the whole state and in neighbouring regions across states' borders. As assets age and ambient temperatures continue to rise in a warming climate, overall energy demand is expected to increase, leading to higher energy bills into the future[1].

Queensland Children's Hospital has embarked on a journey to innovative, data-driven asset management. Key projects demonstrate the integration of AI/machine learning, electrification and net zero strategies to improve energy performance, financial and environmental sustainability.

First, an AI-enabled chiller optimisation system was implemented to enhance the control logic of the hospital's chillers system in the central energy plant. Using machine learning algorithms trained on operational data, the chillers' staging has been optimised to ensure highest efficiency and minimum energy use. This optimisation achieved significant energy savings, with a return on investment of approximately 1.5 years.

With escalating natural gas cost, the availability of new technologies and our strategic alignment with sustainability, we explore into the feasibility of electrifying major thermal systems, including the design of high-efficiency heat pumps to replace gas hot water boilers and new sterilisers with point-of-use electric steam generation to reduce needs of gas steam boilers.

Major hospitals are unlikely to have sufficient rooftop areas for solar electricity generation to meet energy needs. To move hospitals from major energy users to net zero emission, another option is to offset and evaluate offsite solutions, such as green power purchase, carbon credit.

Together, these initiatives illustrate how innovative asset management can drive measurable improvements in operational efficiency, financial sustainability, and lifecycle performance in healthcare facilities.

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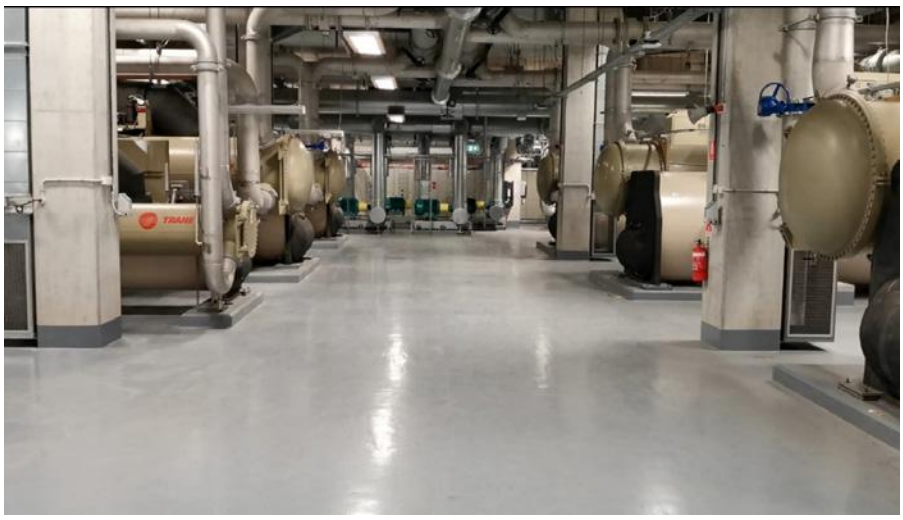


Figure 1 Chiller Plant

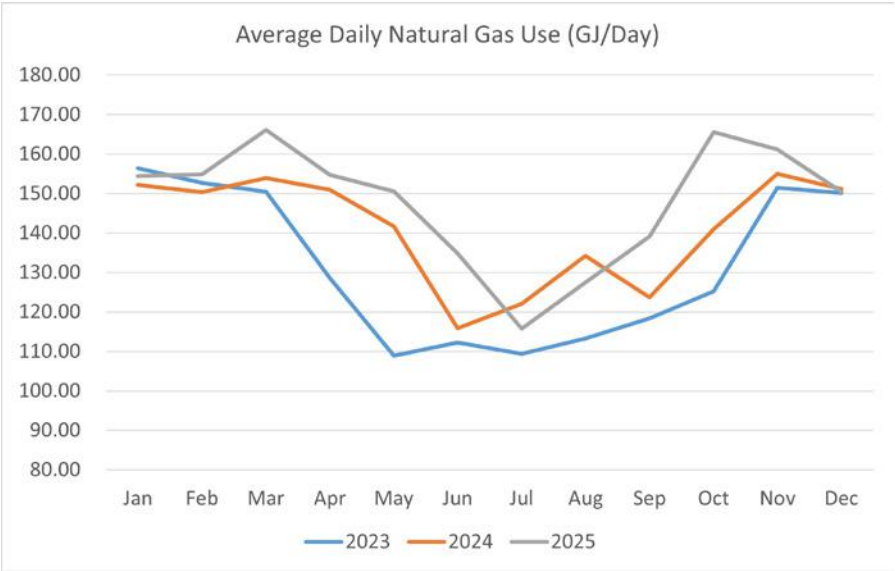


Figure 2 QCH Precinct recent three years natural gas use

Chiller Plant Optimisation

QCH precinct's 2025 operational data show 20% of electricity was used for chillers (Figure 1). The chiller plant is the largest single end use for the whole hospital precinct.

A machine learning based digital twin technology was implemented to optimise chillers' staging sequence in QCH Living Lab project[1]. The project was an initiative of the Innovation Hub for Affordable Heating and Cooling project (i-Hub), which aimed to facilitate the HVAC&R industry's transition to a low-emissions future in Australia.

The machine learning process included collecting historical and in-situ data (like flow rates, temperatures, and energy use), using machine learning to build a "digital twin" mathematical model of the physical plant, running the model under different operation and climate scenarios, and then using an optimisation engine to recommend improved control strategies. The recommended chiller staging logic was implemented on the building management system (BMS) controller, and performance was measured and verified against a baseline model.

During the forty-three-day test period, the optimised staging logic resulted in an energy saving of 24,000 kWh and an emission reduction of 19 tonnes of emission. This represented a 3.3% energy saving for the period. The projected annual impact for QCH includes an energy saving of 187 MWh, a reduction of 150 tonnes of CO2 emissions, and annual bill savings of $28,000 with a simple payback period of 1.5 years.

Nationally, applying this technology to all Australian capital cities' hospitals could potentially achieve over 58 GWh of electricity savings and reduce CO2 emissions by over 43,000 tonnes annually[2]. The technology is a data-driven, low-risk option with no disruption to patient care or comfort levels.

Electrification of Hot Water System

Nationwide, Australian hospitals use lots of natural gas for hot water and steam generation[3]. Traditionally, hot water is thought to be used more in space heating in winter months. However, that is not the case for QCH precinct. Figure 2 presents QCH precinct's recent three years natural gas average daily use by months. Natural gas is used more in summer months due to higher hot water use in summer months for humidity control in the subtropical warm climate.

To generate more hot water in warm summer, a logical way is to use waste heat or take heat from air in those months. Heat pump technologies[2] are possible to achieve this by moving waste heat into a hot water loop.

Several heat pump types exist. Figure 3 is the water sourced heat pump technology that takes heat away from the return of the chilled water loop and transfer this heat into the hot water system. In this way, heat and cooling are generated at the same time to meet buildings' needs.

The detailed design of the heat pump technology is completed, including existing assets removal, installation of new heat pumps and project management costs. Payback period is expected to be within eight years.

Electrification of Sterilisers

Sterilisers are critical part of major hospitals' operation for patients' safety and service delivery. High temperature sterilisers use lots of steam; natural gas is often the energy source for steam and hot water generation in most of Australian hospitals.

Figure 4 shows the steam flow from boilers at the Energy Plant to the sterilisers in the hospital's Central Sterilisation Department. The energy loss in the steam flow is above 50% as per our project engineering calculation.

A practical pathway to improving our financial sustainability and operational resilience is to transition to sterilisers with electric pointofuse steam generation. This opportunity arose as the existing sterilisers and clean steam generators— which currently supply steam to these units — have exceeded their recommended nominal service life and are showing signs of deterioration, requiring replacement. This timing aligned with QCH reaching its tenyear anniversary, making electrification a timely and strategic upgrade option.

To help cut down the energy loss, sterilisers with electric point-of-use steam generation are selected in the design. In this way, reverse osmosis (RO) water is supplied to each steriliser and electrical steam generation system is integrated within each steriliser, reducing the need of steam boilers, steam storage and distribution systems. The new steam sterilisers are no longer reliant on the gas boilers or steam supply piping, which increases resilience of our hospital operation.

In terms of return on investment, saving from the new sterilisation system is expected to exceed the increased cost of the new sterilisers within two years.

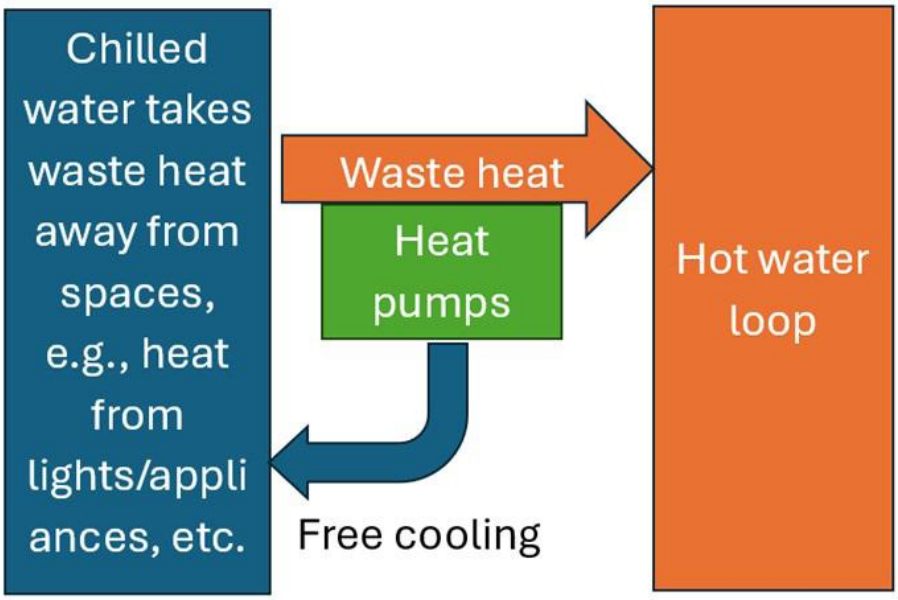


Figure 3 Conceptual diagram for water sourced heat pumps to provide cooling and heating



Figure 4 Existing steam flow from boilers to sterilisers

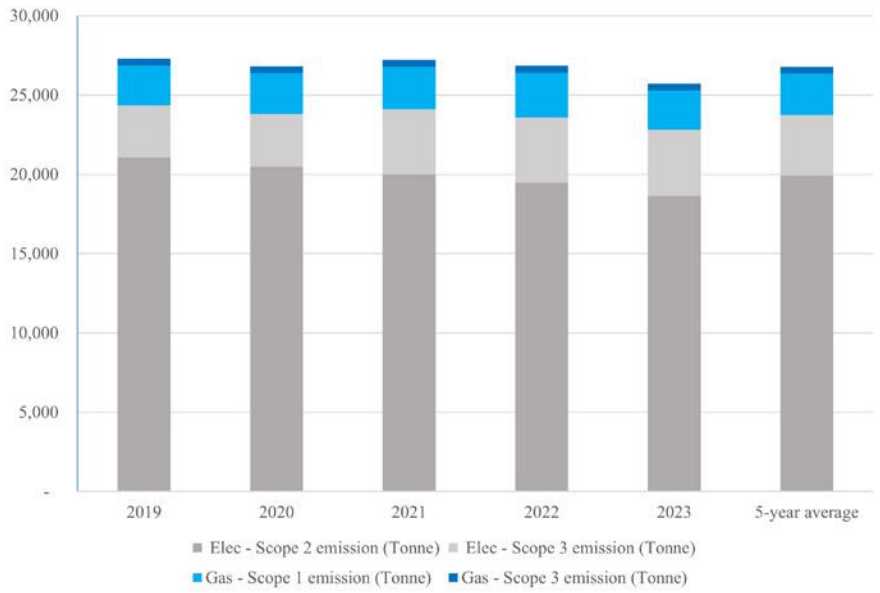


Figure 5 Five-year emission history

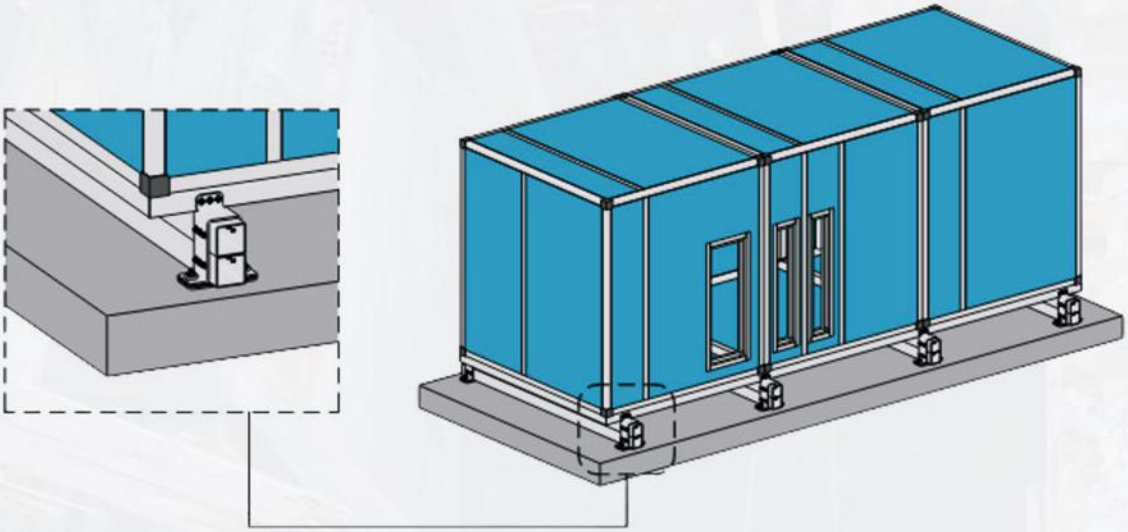
Net Zero Energy Hospital

Major hospitals are often comprised of large buildings in urban or suburban areas where roof solar renewable is an option but far from enough to meet the electricity demand of major hospitals. Besides energy efficiency and onsite renewable generation, electrification and offsetting measures can be evaluated as part of energy management hierarchy.

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A five-year average of the hospital's energy data (Figure 5) is used in the economic analysis of 12 different scenarios, considering future grid renewable percentages, green power purchase, using Australian Carbon Credit Units (ACCUs) to offset emissions, and electrifying natural gas boilers for hot water and steam generation[5].

The analysis results indicate:

- Green power purchase always results in economic savings regardless of combinations with other options.
- Electrification of natural gas boilers has a promising impact especially when the grid renewable energy percentage is higher than 50%.

For hospital facility management, hospitals can leverage electrification technologies to reduce costs and lower emissions, particularly as the electricity grid becomes greener. Decision-making can be supported by evidence-based strategies to achieve cost savings and emissions reduction.

For policymakers, policies should provide targeted incentives and support that align with renewable energy targets to facilitate a more effective transition to net-zero emissions in the healthcare sector.

Conclusion

The above initiatives are the starting points of our innovative asset management journey. Chillers are the largest electricity use of the hospital precinct and the control logic optimisation through the machine learning digital twin model is a low risk and high return investment.

The electrification of hot water system and sterilisers provide a practical evaluation and strategic route for how existing hospitals can be retrofitted into full electric hospitals.

Looking into future power grids of higher renewable percentages, electrification makes more financial sense along with the market-based solution to purchase 100% green power from grid.

The solutions reported in this paper are low risk, no impact to existing IT system nor directly relevant to patients. While health services resilience is enhanced, financial and environmental sustainability aspects are improved as well.

Acknowledgment

Parts of the outcomes in this paper were from QCH i-Hub Living Laboratory research project, funded by Australian Renewable Energy Agency (ARENA), Australian Institute of Refrigeration Air-conditioning and Heating (AIRAH), and Australian industry, in collaboration with Queensland University of Technology (QUT).

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Customised Solution: Australian-first customised application of stabilised hydrogen peroxide to safely control Legionella from a hospital problematic warm water system

Andrew Cook

Executive Summary

A large acute care hospital experienced recurrent *Legionella* detections in sections of an ageing warm water system, despite repeated application of conventional control measures (flushing, thermal disinfection and chlorination). The plumbing network was complex and fragile, and escalation to higher chlorine concentrations was not pursued due to the risk of damaging pipework and components.

To address persistent contamination while preserving infrastructure, the hospital implemented an Australian-first trial using stabilised hydrogen peroxide (SHP) as a secondary disinfectant in the warm water system. The intervention combined an initial "shock" dose designed to disrupt entrenched biofilm, followed by maintenance of a low, stable residual for four months. Residual control was automated using an online analyser, enabling tight process control within an operating healthcare facility.

A structured verification monitoring program was established to confirm baseline conditions and to track both microbiological performance and potential corrosion impacts. A peer reviewed sampling plan defined sampling methodology and objectives, and all laboratory testing was performed by NATA accredited laboratories.

Microbiological monitoring included at least weekly testing for *Legionella* and heterotrophic plate count (HPC), while routine metals analysis provided ongoing assurance regarding corrosion and leaching.

The initial shock dose produced a short lived increase in HPC and widespread outlet discolouration, consistent with rapid biofilm shedding from internal pipe surfaces. HPC then stabilised to low levels, and *Legionella* was not detected for the remainder of the trial period. Concurrently, copper and lead concentrations fell below pre-trial baselines, and physical inspections found no evidence of pitting, surface etching, or seal deterioration.

This case study demonstrates a pragmatic, risk-managed SHP protocol can achieve sustained control of *Legionella* in a problematic warm water system while maintaining the integrity of ageing infrastructure. It also illustrates how robust water quality management should be framed holistically, considering opportunistic

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premise plumbing pathogens (OPPPs) beyond *Legionella*, alongside chemical risks and asset impacts, rather than treating *Legionella* control as a single-issue program.

Why *Legionella* persists in hospital warm water systems

Premise plumbing systems, those parts of a water distribution network downstream of the municipal supply boundary, may create conditions that can selectively favour microbial colonisation. Features such as warm temperatures, stagnation, high surface-area-to-volume ratios, reactive pipe materials, and low or inconsistent disinfectant residuals can support biofilm growth and the persistence of opportunistic pathogens.

In healthcare settings, *Legionella* is a critical concern due to the heightened vulnerability of immunocompromised patients and the potential severity of legionellosis. However, evidence and operational experience increasingly emphasise that water quality management in hospitals is broader than *Legionella* alone. Other OPPPs, including *Pseudomonas aeruginosa* and non-tuberculous mycobacteria (NTM) can also thrive in premise plumbing and have been linked to serious healthcare associated infections and outbreaks.

Because many OPPPs are protected within biofilms and in association with amoebae hosts, they can show resilience against disinfection and can rapidly recolonise after short term interventions.

For hospitals, this creates a dual imperative:

1. Control pathogens effectively and sustainably (not just transiently), and
2. Do so without damaging critical infrastructure or introducing unacceptable chemical risks.

Problem statement: recurrent *Legionella* in a complex, fragile warm water system

The hospital at the centre of this case study is a large acute care facility with an ageing warm water system. Parts of the network experienced recurrent *Legionella* detections. Previous repeated attempts using traditional control measures of flushing, thermal disinfection and chlorination had not achieved sustained resolution, in part due to the limitations posed by a complex and fragile plumbing system.

Critically, while chlorination is a common control tool, increasing chlorine concentrations can elevate corrosion risk, accelerate material degradation, and exacerbate metals release, concerns that are amplified in older systems with mixed materials, legacy fittings, and sensitive components. In this facility, higher chlorine concentrations were not attempted because of the likely risk of damaging the plumbing system.

The consequence was a persistent operational and clinical risk; ongoing detections demanded repeated response actions, increased workload, reduced confidence in water

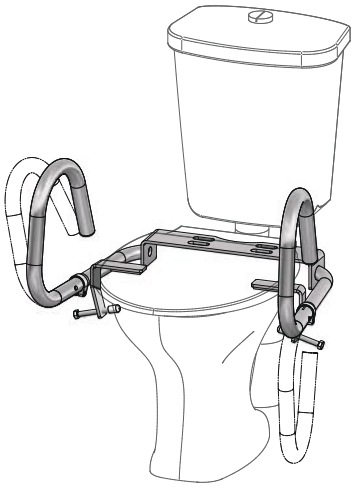
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safety controls, and potential exposure risk for vulnerable patients and staff.

Objectives of the SHP intervention

The trial was designed with a clear set of practical objectives aligned to hospital risk and operational constraints:

1. **Eradicate Legionella from affected parts of the warm water system** and sustain non-detect status over a meaningful operational period.
2. **Disrupt and manage biofilm**, recognising entrenched biofilm is a key driver of persistence and recolonisation.
3. **Preserve infrastructure integrity,** avoiding corrosion, pitting, seal damage, or increased metals release especially important in ageing plumbing.
4. **Operate safely in an active healthcare facility**, with controlled dosing, verified monitoring, and transparent governance.

Trial design and governance

Pre-trial verification and planning

Before introducing SHP, the hospital undertook verification monitoring to establish baseline microbial and metals conditions.

This served multiple purposes:

- Quantify the extent of contamination and general microbial activity (via HPC and *Legionella*).
- Provide baseline metals data to contextualise any changes during the trial and detect early signs of corrosion or leaching.
- Support evidence based decision making and stakeholder assurance (infection prevention, engineering, executive governance).

A peer reviewed sampling plan was developed to provide clarity around sampling methodology and objectives. This step is especially important in healthcare settings, where inconsistent sampling approaches can create confusion and erode trust in results. All laboratory testing was completed by NATA accredited laboratories, supporting defensibility and comparability of outcomes.

Intervention strategy: shock + controlled residual

The hospital implemented a two phase SHP strategy:

- Phase 1: Shock dose to rapidly disrupt entrenched biofilm.
- Phase 2: Low, steady residual maintained for four months, controlled automatically using an online analyser.

This structure addresses a common failure mode of "single event" interventions (e.g., thermal shock alone); even if organisms are temporarily reduced, biofilm protected niches can reseed the system. By pairing disruption with sustained residual control, the protocol aimed to prevent recolonisation while the system stabilised.

Monitoring framework: microbiology + corrosion assurance

Microbiological monitoring

Performance was monitored with at least weekly testing for:

- *Legionella* (primary risk organism for this case study)
- Heterotrophic Plate Count (HPC) as a proxy indicator of general microbial biomass and system stability

The use of HPC is operationally valuable as shifts in HPC can indicate biofilm disturbance, flushing effects, or changes in microbial ecology even when *Legionella* is not detected.

Metals monitoring and asset integrity

Routine metals analyses were undertaken to track corrosion and leaching impacts over time.

This aligns with broader water safety concerns highlighted in healthcare systems, where chemical contamination (such as elevated lead from fittings) can pose serious health, reputational, and cost risks.

Results

Evidence of biofilm disruption (expected transient effects)

Following the shock dose, monitoring detected:

- A brief spike in HPC, and
- Discoloured water across most outlets

Rather than being interpreted as failure, these were treated as confirmatory signals of rapid biofilm shedding from internal pipework an anticipated outcome when disrupting established biofilm layers.

Stabilisation and sustained microbial control

After the initial disturbance:

- HPC levels stabilised to low levels, and
- *Legionella* was not detected during the maintained residual period

From an operational perspective, the significance here is *stability*: the system moved from recurrent detections requiring repeated interventions to a controlled state supported by routine monitoring and process control.

Metals and infrastructure outcomes

The trial produced favourable asset and chemical outcomes:

- Copper and lead concentrations fell below pre-trial baselines, and
- Inspections found no pitting, surface etching, or deterioration of seals

These outcomes are particularly material for ageing hospital infrastructure, where many disinfection options carry a real risk of accelerating corrosion or increasing metals release.

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Discussion: why this approach worked in a "problematic" system

Addressing the root cause: biofilm as the engine of persistence

The observed short term HPC spike and discolouration strongly indicate the initial shock dose effectively stripped or mobilised biofilm material.

Because *Legionella* is well adapted to biofilm growth and can be protected within biofilms and amoebae hosts, a strategy that meaningfully disrupts biofilm is more likely to deliver sustained control than strategies focused only on bulk water conditions.

Why long term residual control matters

A key lesson in premise plumbing pathogen management is that "one off" treatments often fail to prevent recolonisation, particularly in complex networks with stagnation zones, temperature gradients, and variable usage.

Maintaining a stable residual for four months with automatic control via online analysis shifted the intervention from episodic response to controlled process, reducing reliance on repeated disruptive measures.

Infrastructure preserving disinfection as a decision criterion

Hospitals cannot treat water safety as purely microbiological. Chemical and asset risks are interdependent. Corrosion can increase metals release, damage fittings, and create conditions that further promote biofilm formation and microbial harbourage.

The trial's metals and inspection outcomes suggest the SHP protocol achieved pathogen control without trading off infrastructure integrity.

Implementation considerations for other hospitals

Based on the approach and outcomes in this case study, the following considerations can guide replication:

1. Start with defensible baselining and a clear sampling plan. Baseline microbiology and metals data, coupled with a peer reviewed sampling plan, reduces ambiguity and helps align engineering and clinical stakeholders.
2. Expect (and plan for) transient water quality effects during biofilm disruption. Short lived turbidity/discolouration and HPC elevation may occur during initial cleaning/disruption phases.
3. Automate residual control where feasible. Online monitoring and automated dosing can stabilise control and reduce operational variability which is important in a 24/7 clinical environment.
4. Integrate asset protection into success criteria. Routine metals monitoring and targeted inspections should be built into the governance framework, not added after concerns arise.
5. Keep the program holistic. Even when *Legionella* is the immediate trigger, the broader OPPP and chemical risk context should inform decisions on temperature management, disinfection strategy, stagnation reduction, and fixture design.

Conclusion

This Australian-first hospital trial demonstrates a customised solution using stabilised hydrogen peroxide can be deployed as an infrastructure preserving disinfection protocol capable of sustained *Legionella* eradication in an ageing, problematic warm water system. The two phase approach, shock dosing for biofilm disruption followed by a controlled low residual maintained for four months delivered non-detect *Legionella* outcomes after initial biofilm shedding signals (temporary HPC spike and outlet discolouration).

Equally important, the trial showed no evidence of adverse infrastructure impacts. Metal concentrations decreased relative to baseline, and inspections found no material deterioration such as pitting or seal damage.

Finally, this case reinforces a contemporary best practice for healthcare water programs, where effective risk management is broader than *Legionella* control alone, and should incorporate other OPPPs and chemical risks within a robust, multibarrier, verification led framework.

The Global Burden of Antimicrobial Resistance and Healthcare-Associated Infections

As a healthcare professional, are you feeling the heavier weight on your shoulder to provide care, while also dealing with compressed budget constraints and overflowing operational demands? Across Australia, all healthcare facilities have now recognised that hygiene is the vital strategic value in the ongoing fight against healthcare-associated infections and antimicrobial resistance.

We all are, in fact, under the burden to be able to predict outbreaks before they happen. This requires a synergistic approach that combines human-operated precision with the efficiency of technology.

The Advantage of Precision Machinery

Certain cleaning tasks, especially in complex areas, require human-operated precision to achieve a 'deeper clean'. Think of patient bathrooms, high-touch surfaces in treatment rooms, or the fine grout lines in tiled areas — these places are notoriously difficult to clean properly.

This is where specialised machinery excels. For example, Duplex's Floorscrubbers use a unique contra-rotating brush technology to reach deep and remove embedded contaminants, which is vital for infection control in tight spaces like patient bathrooms and busy treatment rooms.

For detailed cleaning, Duplex's Jetsteam and Jetvac machines, powered by Tecnovap technology, are key. Effective steam cleaning machines should be reliable, effectively clean and disinfect high-touch points, sensitive equipment, and hard-to-reach crevices where traditional methods fail. This high-heat steam should effectively kill bacteria, viruses, and mould without harsh chemicals, which cuts chemical costs and makes the environment safer for patients, visitors, and staff. The industrial components ensure continuous, high-performance operation. In Jetvac models, the combination of high-heat cleaning and instant vacuuming leaves surfaces hygienically clean and dry quickly, which is critical for rapid room turnaround.

Smarter Staff, Smarter Systems

Of course, precision alone is not enough. Hospitals and aged care facilities are vast, and keeping them spotless is a never-ending challenge. Staff are stretched, and every extra hour spent pushing a mop is an hour not spent on patient care.

That's why many facilities are turning to robotic scrubbers from innovators like FloorBotics. These autonomous machines quietly cover long corridors, open foyers and waiting areas with clockwork efficiency. They don't get tired, they don't miss patches, and they provide consistent results shift after shift.

This isn't about replacing human workers — it's about freeing them. Instead of spending time on repetitive chores, cleaning teams can focus on the delicate, complex tasks that only people can handle. Staff satisfaction rises, burnout drops, and patients benefit from more attention.

Data That Works Harder

One of the under-appreciated benefits of robotics is information. These machines map their environments and report back with precise cleaning coverage. That means managers know exactly which areas were cleaned, when, and with what efficiency. For audits and compliance, that level of detail is gold. For continuous improvement, it's a game-changer.

A Synergistic Approach for Enhanced Care

A forward-thinking approach to healthcare hygiene combines the detailed precision of human-operated, high-performance machines like advanced scrubbers and powerful steam systems with the tireless efficiency of autonomous robotics. This integrated strategy creates a smarter, more cost-effective way to work. By embracing this approach, healthcare facilities can elevate care quality, not just in hygiene, but in all aspects of operational excellence, which directly helps in the fight against antimicrobial resistance.

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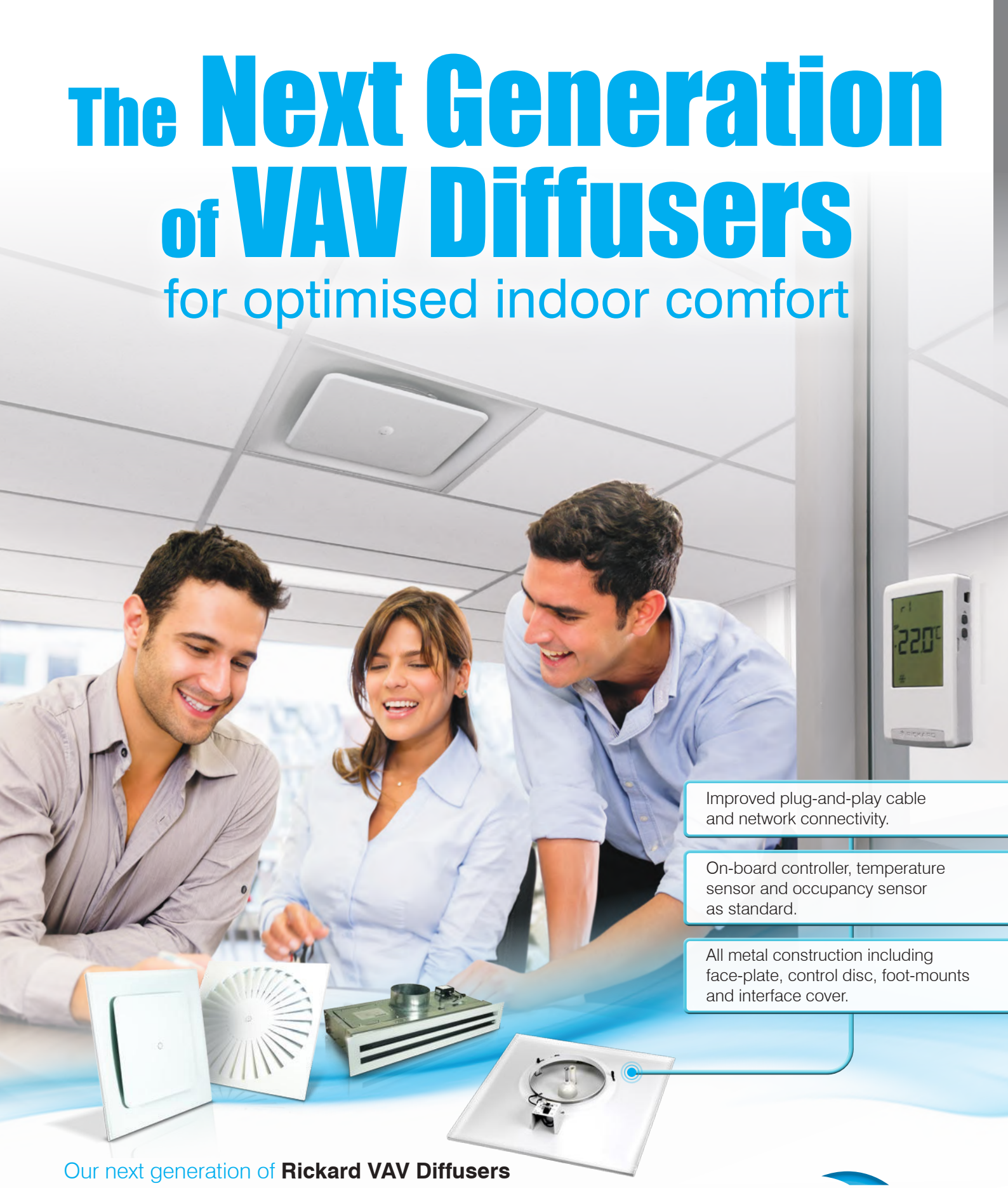
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The Clinical Cost of Nuisance: Evolving Healthcare Fire Safety Through Data Driven Automation

Phil Yang

1. Executive Summary

Automatic fire alarms (AFAs) are critical life safety infrastructure in healthcare facilities where protecting lives is paramount and every minute matters. Hospitals, aged care facilities and healthcare clinics rely on these systems to alert staff, initiate evacuation procedures and coordinate emergency responses. However, when alarms are triggered unnecessarily they can create significant financial, operational and patient safety risks. Research indicates that unwanted AFAs cost New South Wales alone between $246 million and $349 million annually, while the true national burden is estimated to exceed $1.1 billion[1].

Approximately 97% of all healthcare callouts are found to be unwanted alarms[2], which degrade the patient care experience by interrupting planned medical appointments and inducing stress in vulnerable populations. Recent data from the NHS suggests that false fire alarms are increasing at a rate of 16% in the UK, highlighting a worsening trend[3]. These activations force clinical staff away from their primary duties, creating gaps in care delivery and eroding the trust that patients place in the facility's safety environment.

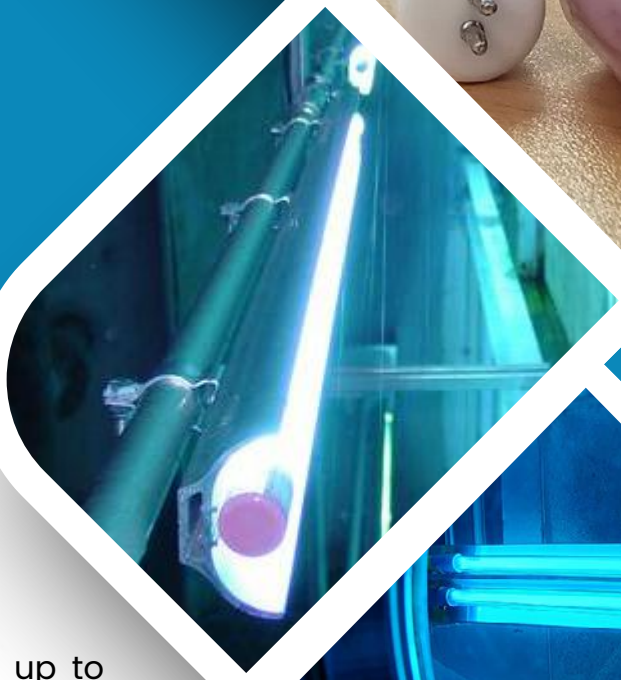
Alongside this sits a hidden burden: the continued reliance on manual, paper-based compliance administration. This white paper argues that the next evolution of fire safety management is in transitioning from reactive, manual processes to data-driven, automated governance. By leveraging real-time fire data and automated workflows, healthcare facilities can shift toward predictive maintenance, automated regulatory workflows and significantly improved patient safety outcomes. Fire safety and compliance are no longer back-office concerns, they directly shape the safety culture and the sustainability of healthcare operations.

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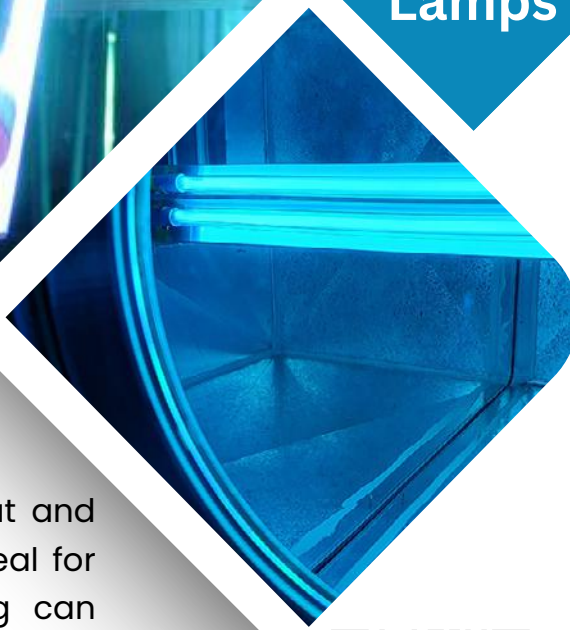
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2. The Problem: Causes and Economic Impact

2.1 Causes of Unwanted Alarms

Healthcare facilities are uniquely susceptible to false alarms due to their complex, continuously active environments. Primary causes of these activations include:

- Cooking, sterilisation and laboratory equipment: Smoke or steam from cafeterias, nurses residents, kitchens and clinics.
- Construction and maintenance activities: Dust, welding fumes or aerosolised cleaning agents.
- Environmental or external factors: Humidity, bush fires or air-conditioning systems in large hospital wings.
- Technical malfunctions: Outdated systems or improperly calibrated detectors.
- Occupant error: Staff or visitors accidentally triggering manual call points.

A critical factor in this challenge is the technology itself. Research highlights that smoke detectors are often the primary source of nuisance alarms due to their sensitivity to non-fire signatures[4]. In healthcare, these are frequently triggered by laboratory equipment, dust from maintenance or environmental factors such as high humidity and steam from kitchens.

2.2 Economic Impact

The economic toll is substantial, where national annual activations in Australia translate to a total cost burden of $625M–$1.1B per year[5]. Within healthcare classified facilities, the per-incident economic impact is substantially higher than other buildings with medical care centres averaging $7,615 per alarm; nursing homes $10,714; and high-acuity hospitals where total costs can exceed $50,000[5] when surgical rescheduling, staff mobilisation and patient care disruption are fully accounted. This includes the high cost of emergency response personnel, whose time is diverted from genuine emergencies. Fire brigades across Australia also apply strict criteria for chargeable alarms, adding further administrative complexity for building owners and facility managers who must navigate complex waiver conditions.

3. Patient Safety Impact and Alarm Fatigue

Unwanted fire alarms carry consequences that extend well beyond the immediate disruption. Research consistently demonstrates that frequent unwanted activations create alarm fatigue, a progressive desensitisation to alarm signals that increases the risk of a genuine emergency being underreacted to or missed.

In high-dependency clinical environments, the risks are particularly acute. Patients on ventilators, receiving dialysis or in post-operative recovery face genuine clinical risk from unplanned movement during evacuations. The physical stress of movement, coupled with the interruption of life-sustaining treatment, creates a danger profile that often exceeds the risk of the perceived fire itself.

In addition, infection control protocols may be compromised when evacuation routes move patients across clinical zones, potentially leading to the spread of hospital-acquired infections. These indirect patient harms are difficult to fully quantify but represent a real threat to the quality of care.

4. Case Studies: Real-World Consequences

Several cases illustrate the breadth of consequences when manual fire safety processes and false alarm management are inadequate. These examples highlight the need for a transition to automated, data-driven systems.

Regional Aged Care Facility: Repeated false alarms triggered by aerosol sanitation products caused multiple resident evacuations, resulting in disorientation, falls and anxiety. Total operational and staffing costs reached $50,000[5], with additional reputational damage from family concerns about resident welfare. The facility struggled to identify the specific trigger points until a data-driven sensor analysis was conducted.

Diagnostic Imaging Centre: A single false alarm disrupted MRI and CT schedules, delaying time-sensitive patient scans and costing $20,000[5] in lost revenue, rescheduling costs and staff overtime. The delay in diagnostic scans led to prolonged hospital stays for multiple patients, illustrating the ripple effect of a single unwanted activation.

Sydney Adventist Hospital: As the largest single-campus private hospital in New South Wales, the hospital implemented a digital platform[6] to address alarm activation tracking, digital isolation recording and fire system compliance management. The digital isolation logbook replaced a paper-based process that lacked real-time visibility and automated escalation for extended isolations. This restored visibility to the engineering team, ensuring that no system component remained offline longer than necessary. False alarm waiver recoveries from the platform implementation recovered majority of the technology cost within the first year.

5. The Hidden Burden: Manual Administration and Compliance Risks

Alongside the cost of unwanted alarms sits the relentless burden of manual risk administration. Many operational teams still manage fire safety through manual processes, such as handwritten logbooks and paper checklists for daily valve room inspections. The scale of this burden is significant. One large shopping centre in NSW was conducting three separate valve room inspections per day, each taking up to 30 minutes. After implementing a digital inspection workflow, this was reduced to a single daily inspection, freeing nearly an hour of engineering staff time every day.

Manual reliance creates a silent risk where isolation records may fail to capture the approval chain or restoration date. Modern standards are increasingly moving toward digital documentation to mitigate these risks. A major shopping centre in Queensland

faced a scenario where a contractor isolated detectors and pumps for over 24 hours. The fire mimic panel alarmed but was silenced due to accumulated alarm fatigue from prior nuisance alerts, and the breach was only discovered during an actual fire event. Manual processes also hinder cost recovery; claiming waivers requires documented evidence that is frequently abandoned due to administrative complexity and strict submission limits. This creates a cycle of preventable financial loss and unrecorded risk.

6. The Solution: Smarter Fire Safety Management

Effective fire safety management in healthcare requires systematic data collection and governance across the full operational portfolio. The transition to a technology-led approach replaces reactive habits with proactive management. Platforms are now available which allow for real-time visibility by integrating directly with Fire Indicator Panels (FIPs) to capture every activation and isolation event[6]. This shift is not simply digitisation for its own sake; it is the systematic automation of a process category that currently consumes disproportionate staff time and creates risk.

Core capabilities of such systems include real-time alarm management, where activations are captured automatically to provide guided workflows for operations teams. Predictive analytics identify hotspot zones and devices associated with recurring faults before they trigger an alarm. This allows for targeted maintenance interventions, moving from a schedule-based approach to one based on actual device health.

Manual processes introduce "silent risks" where isolation records may fail to capture the approval chain or restoration date, leading to compliance gaps that go undetected until an audit or incident. Modern standards are increasingly moving toward digital record keeping mitigating these risks[7]. Digital isolation logs provide auditable records with automated alerts if a duration exceeds predefined limits. Notification workflows can auto-generate complete waiver submissions aligned to brigade guidelines, ensuring recoverable costs are reclaimed while reducing administrative time from 30 days to 3 days per activation. This efficiency allows engineering teams to focus on critical infrastructure rather than administrative paperwork.

7. Training, Behavioural Interventions and Culture Change

Technology alone is insufficient without the cultural and behavioural change to support it. Facilities managers and clinical staff require regular training covering the consequences of false activations and the correct use of equipment. A recent study found that 83.3% of healthcare personnel did not consider themselves adequately trained to manage fire emergencies[8]. This gap in competency is a significant risk factor that must be addressed through continuous professional development and standardised induction programmes.

Leadership buy-in and change management is essential; the value of digitising inspections will not be realised if staff continue to complete paper records in parallel or if management does not act on the real-time dashboard data provided. Process re-engineering must begin with an honest assessment of current workflows and a willingness to redesign those processes around automation rather than manual habit. Embedding fire alarm awareness into healthcare worker induction programmes and annual competency frameworks increases the likelihood of behaviour change at the point of risk. This shift allows contractors to deliver higher value services to building owners, focusing on system performance rather than just ticking boxes on a sheet. Additionally, manual processes often lead to the abandonment of legitimate waiver claims for fire brigade fines due to administrative complexity and strict submission limits which leaves significant commercial benefits on the table.

8. Conclusion

Fire safety and compliance in healthcare is not a back-office function; it is a direct determinant of the patient care experience, clinical safety culture and operational sustainability. Unwanted nuisance fire alarms and laborious compliance administration are not features of healthcare facility management. They are solvable problems that demand attention, investment and leadership. The current reliance on manual systems is a legacy habit that is increasingly incompatible with the requirements of modern healthcare.

Addressing this challenge requires a shift toward the digitisation of inspections, the replacement of paper logbooks with digital workflows and the automation of the fire alarm administration process. The investment required is modest compared to the cost of inaction measured in fines, clinical disruption and risk to patient outcomes. Ultimately, investing in smarter fire safety processes protects lives and ensures that the emergency systems healthcare facilities depend on remain reliable when they are needed most. The data and technology are available; the next step is the commitment to evolve.

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The IHEA National Conference once again brought together the people who quietly underpin the performance of Australia's healthcare system. Hospital engineers, facility managers, and technical leaders are responsible for keeping critical environments safe, compliant, and operational. As a Gold Sponsor, Leading Edge Automation had the opportunity not just to participate, but to listen closely to the challenges shaping the future of healthcare infrastructure.

A clear theme emerged across the conference: managing health infrastructure risk is no longer just about assets and systems. It is about people, process, technology, and innovation working together in a way that supports long term ownership and resilience.

At the centre of this conversation are people. The availability of skilled resources continues to be a growing concern across the sector. Many hospitals are facing gaps in technical capability, while also dealing with the challenge of retaining knowledge as experienced personnel move on. This creates a dependency on individuals or external vendors, which introduces risk, particularly when support is needed outside of standard hours. True resilience comes from building systems and environments where knowledge is shared, accessible, and not locked within a single person or provider.

Process is equally critical. Strong documentation and consistent standards form the backbone of any reliable infrastructure environment. Without them, even well designed systems can become difficult to manage over time. Change management plays a key role here, ensuring that updates and modifications are controlled, recorded, and understood. This directly impacts compliance and audit readiness, which remain constant pressures in healthcare environments. Effective handover and continuity processes also ensure that systems remain manageable regardless of personnel changes, reducing risk across the lifecycle of the facility.

Technology continues to evolve rapidly, but the principles for managing risk are becoming clearer. The debate between open and closed systems is no longer theoretical. Open systems provide flexibility, interoperability, and the ability to adapt over time, while closed systems often introduce limitations and long term dependency. Cybersecurity and access control are now fundamental considerations, not optional extras. At the same time, system transparency is becoming essential. Engineers need visibility into how systems operate, not just alerts when something fails. Long term maintainability must also be a priority, ensuring that systems can be supported, updated, and scaled without excessive cost or complexity.

Innovation ties all of these elements together. Smarter integration between systems allows hospitals to move beyond silos and create more connected environments. There is also a growing opportunity to make better use of operational data, turning information into insight that can support proactive decision making. Importantly, innovation must be grounded in designing for ownership. Solutions should empower healthcare organisations rather than create further dependency. This means supporting people and processes, not just introducing new technology.

Managing health infrastructure risk today means supporting hospital engineers with systems that are open, transparent, and designed for long term ownership. It requires a shift away from short term thinking and toward strategies that strengthen capability over time. The organisations that succeed will be those that align people, process, technology, and innovation in a way that reduces dependency, increases visibility, and supports sustainable operations.

As a Gold Sponsor, Leading Edge Automation is proud to support this direction.

Our focus is on delivering solutions that prioritise openness, transparency, and long term maintainability. We work closely with healthcare organisations to ensure their systems are not only fit for purpose today, but remain adaptable and manageable into the future. By reducing reliance on closed technologies and improving access to meaningful data, we help hospital engineers take greater control of their environments.

The IHEA National Conference reinforced the importance of collaboration across the industry. By continuing to focus on practical, sustainable approaches to infrastructure risk, we can collectively build stronger and more resilient healthcare facilities.

Leading Edge Automation looks forward to continuing to support this journey and partnering with healthcare organisations to deliver better outcomes for their teams and the communities they serve.

Check out some of our Healthcare projects here.

ADVERTORIAL

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COMPRESSED AIR & GAS SOLUTIONS



The Vital Role of Air Compressors in Healthcare

Breathing Reliability into Healthcare

In healthcare, reliability is not optional — it is critical. Behind every ventilator, surgical instrument, and respiratory system lies a fundamental yet often overlooked utility compressed air. Silent in operation but vital in impact, it supports life-critical applications with precision, consistency, and safety.
As a German manufacturer of compressed air equipment, BOGE Compressors brings engineering excellence and decades of expertise to this highly sensitive sector. In modern hospitals, clinics, and laboratories, clean compressed air is indispensable for patient care, research, and operational efficiency. From respiratory therapies to surgical tools, its role is integral to maintaining the highest standards of medical practice.

Uncompromising Air Quality

In medical environments, air quality is non-negotiable. Compressed air must be free from oil, particles, moisture, and odours to ensure patient safety and equipment reliability. Oil-free compressor technology eliminates contamination risks at the source, delivering air that complies with stringent standards such as AS 2896:2021 (Medical Air and Air for Surgical Tools) and AS/NZS 1715:2009 (Supplied Air RPE).

Applications of Compressed Air in Healthcare:

Medical compressed air has several key applications, including:

Ventilators and Incubators: Providing uncontaminated and controlled air flows to reduce high concentrations of oxygen exposure.
Anaesthetic Agents: Serving as a carrier gas.
Nebulizer: Drug delivery via a nebulizer
Medical devices: Testing and drying of medical devices
Manufacturing of medicines, medical devices and other equipment
Surgical Tools: Powering instruments in the operating room.
Dentistry: Oil-free compressors power suction systems to remove fluids during procedures.
Respiratory Therapies: Vital components of ventilators and CPAP machines, delivering consistent air flow at required pressures.

Diagnostic Procedures: Powering MRI machines, dental tools, and laboratory instruments, ensuring smooth and quiet operation for patient comfort and accurate diagnostic tests. The air used in these settings must be free of contamination, particles, oil, and odors to ensure patient safety and equipment reliability.

Supporting Surgical Precision
Surgical air compressors power critical instruments like pneumatic drills, saws, and handheld tools for precise surgical procedures and sterilization systems. They also support laboratory equipment for blood analysis and gas generation. Meeting stringent standards, medical-grade compressors ensure clean, dry, and oil-free air to prevent infections and ensure patient safety.

Engineered for Continuous Operation

Healthcare facilities require uninterrupted compressed air supply 24/7. From bedside care to operating theatres, system reliability is paramount. Modern medical air systems are therefore designed with a minimum of triple redundancy, ensuring continuous operation even during maintenance or unexpected failures.
For over 50 years, BOGE has partnered with OEMs, consultants, and healthcare equipment manufacturers to deliver customised, fully compliant system solutions. Our focus remains on reliability, efficiency, and long-term performance—qualities that healthcare providers depend on.

BOGE oil free Scroll Compressors 4-30KW

BOGE's EO Series oil-free scroll compressors are purpose-built for medical and research environments. Ultra-compact, modular, and exceptionally quiet, they deliver certified "Class Zero" oil-free air worldwide.
Key technical advantages include:

- Whisper-quiet and low-vibration operation
- Virtually pulsation-free compressed air
- Modular, demand-driven scalability
- Integrated refrigerant dryer options
- Compact design enabling smart redundancy
- Low maintenance with high operational reliability
- Interlocking control systems further enhance efficiency by eliminating idle running while optimising energy consumption and capacity utilisation.



Intelligent Control for Critical Infrastructure

BOGE's advanced master control system manages the entire compressed air network with precision. By continuously monitoring demand, it determines the optimal number of compressors required and dynamically adjusts system performance.

- Automatic load balancing and demand response
- Compensation for offline units due to maintenance or faults
- Built-in failover through individual compressor controls
- Seamless integration with hospital Building Management Systems (BMS)

This ensures full transparency, operational security, and uninterrupted air supply at all times.



Engineering Trust in Every Breath

As a German manufacturer, precision, quality, and reliability are at the core of everything we do. In healthcare, these are not just expectations—they are responsibilities.
In an increasingly demanding healthcare landscape, investing in high-quality, oil-free compressed air systems is essential for resilience, safety, and performance. Because when every breath matters, the technology behind it must perform without compromise.



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Clean Air in Healthcare Facilities: A Mission, Not an Option

Clean air isn't an abstract ideal—especially in healthcare. For facility managers in hospitals, clinics and allied health environments, indoor air quality (IAQ) directly affects patient outcomes, staff wellbeing and infection control. From critical care units to waiting rooms, every space requires carefully managed airflow, humidity and ventilation to ensure both comfort and safety.

In healthcare settings, inadequate air quality can contribute to the spread of airborne pathogens, compromise recovery for patients with respiratory vulnerabilities and increase staff absenteeism due to illness. Proper air management isn't simply about comfort—it's about infection control, regulatory compliance and operational resilience.

Healthcare ventilation systems—comprising HVAC units, filters, ducting and pressure controls—play the central role in removing contaminants, supplying fresh air and maintaining environmental conditions that support both clinical and non-clinical functions. According to established infection control principles from the CDC, well-maintained HVAC systems help control temperature, regulate humidity, remove stale air and prevent the spread of airborne infections.

But commissioning systems is only half the equation. The other half—arguably the more critical—is ongoing measurement, verification and maintenance to ensure those systems continue to perform as designed. This is where measurement technology becomes indispensable.

The Role of Measurement in Air Quality Assurance

Clean air cannot be assumed; it must be demonstrated. Facility managers need reliable data—on airflow, pressure, humidity, temperature and contaminants—so they can confidently assess performance, identify issues, optimise efficiency and document compliance. Regular measurement supports proactive maintenance strategies, avoids costly reactive fixes and helps facilities meet both internal quality targets and external regulatory requirements.

Recognising this, Testo's facility management solutions are engineered to help FM professionals measure, monitor and document indoor air quality and building system performance with precision. From portable instruments to comprehensive data systems, Testo supports every stage of building performance management.

Precision Tools for a Healthy Indoor Environment

Testo's range of instruments enables facility teams to tackle a wide range of tasks related to healthcare air quality and HVAC system maintenance:

- Indoor Air Quality Measurement: The Testo 400 universal IAQ instrument allows detailed measurement and documentation of key parameters—including CO_2 concentration, humidity, temperature and air velocity—helping facilities validate indoor conditions against comfort and health standards.
- Climate and Air Flow Analysis: Multifunction instruments like the Testo 445 provide simultaneous measurement of air velocity, volume flow, temperature and humidity—data essential for balancing ventilation systems and ensuring targeted air changes are achieved throughout facilities.
- Pressure and Ventilation Diagnostics: Maintaining correct positive and negative pressure relationships in areas such as isolation wards and operating rooms is vital for infection control and air movement. Testo's instruments deliver accurate pressure readings that help verify that air barriers perform as intended.



These tools not only support troubleshooting and optimisation, but also deliver traceable, documented results that help facility managers demonstrate compliance with internal protocols and external standards.

Leading with Data for Operational Confidence

Facility managers who embrace measurement and monitoring are better positioned to anticipate problems, optimise system performance and prioritise maintenance activities before issues escalate. Data-driven approaches reduce downtime, support energy-efficient operations and enhance occupant comfort—while ensuring indoor air quality remains aligned with contemporary expectations in healthcare design and operation.

Moreover, accurate, repeatable measurement builds organisational confidence. Whether preparing for accreditation assessments, responding to patient concerns or planning infrastructure upgrades, detailed performance data helps facility leaders make informed decisions rooted in empirical evidence.

Air Quality and the Future of Healthcare Facilities

As healthcare continues to evolve, so too does the science of indoor environmental quality. The demand for more precise, continuous monitoring will grow, and facility managers will increasingly rely on advanced measurement technologies to stay ahead of risks and deliver healthier indoor environments.

Clean air isn't just a building service—it is a core component of quality healthcare delivery. With instruments like those from Testo, facility managers have the tools they need to not only measure what matters but also to act with clarity, confidence and purpose in maintaining the health of the buildings—and the people—under their care.

https://www.testo.com/en-AU/downloads/facility-management-technical

MEDICAL GRADE WATER – ON A MINI SCALE



A variety of reusable medical devices require safe sterilisation between uses, as governed in Australia by AS 5369:2023.

Clean, pure water is essential to protect autoclaves and surgical equipment from scale, contamination and microbiological growth. In hospitals, this is often achieved through large RO, EDI/resin polishing and UV treatment systems, supported by PLC/HMI controls. Smaller practices, such as dental surgeries, need a more compact and practical solution.

In a joint project with Tony Parker of Continental Water, the Aquarius ULTIMA is being used to help create a groundbreaking new mobile ultrapure water purification unit.



Using ULTIMA's powerful timer functionality, the system manages hydrogen peroxide sanitiser circulation and purge sequences without the need for an additional PLC/HMI.

The package integrates RO filtration, UV treatment, valves, pumps, dosing, flow, temperature and level sensors, with online monitoring via AquaReporter.

It's a mighty system with a mini footprint – innovation at its best!

Contact sales@aquariustech.com.au for more information.

Revitalising Healthcare Floors — Without the Disruption

By Higgins Coatings

Higgins
Better painting management

In healthcare environments, flooring is more than an aesthetic consideration. It is a critical component of infection control, patient safety, and operational continuity. Yet for many facility managers, the prospect of floor replacement triggers a familiar dilemma: the floors need attention, but the cost, downtime, and disruption make full replacement feel almost impossible to justify.





Higgins Coatings' Floor Rejuvenation service was developed precisely for this challenge.

Rather than tearing out and replacing existing flooring, our process restores tired, worn surfaces to a like-new condition — typically within just one to two days. Using high-performance Dr. Schutz treatment systems, globally recognised for durability in demanding commercial environments, we deliver seamless, hygienic finishes specifically engineered for operating theatres, clinical areas, and high-traffic hospital corridors.

The financial case is compelling. Floor rejuvenation typically costs up to 50% less than full replacement, eliminating expenses associated with removal, disposal, and extended downtime. Rejuvenated floors meet healthcare compliance standards, resist chemical exposure, and are easy to maintain — all without extended facility shutdowns.



A Complete Maintenance Solution for Healthcare Facilities

Floor Rejuvenation is just one part of Higgins Coatings' comprehensive service offering for the healthcare sector. As Australia's leading commercial painting and maintenance provider — family owned and operated since 1949 — we bring the scale of a 25-branch national network with the expertise of local, on-the-brush specialists. From interior and exterior painting and ongoing painting maintenance to specialised access works, Building Services, and external façade cleaning via our Altitude Aerial Pressure Washing service, we can provide facility managers a proactive, structured approach to asset care — reducing reactive spend and protecting the built environment year-round.

With 25 branches across Australia, there's a Higgins team local to you — ready to deliver smarter, safer, and more cost-effective maintenance solutions for your healthcare facility. For more information visit www.higgins.com.au or contact 1300 HIGGINS.

The Australian Government has confirmed that tri-phosphor fluorescent lamps will be phased out by December 2027, as part of a national move to eliminate mercury-containing lighting. For healthcare facilities, this is not a routine upgrade—it is a deadline-driven compliance issue that requires immediate planning.

Hospitals and health facilities face a unique challenge: lighting systems are deeply embedded within existing electrical infrastructure, and replacement programs must be delivered without disrupting critical services. Delayed action risks compressed project timelines, increased costs, supply chain constraints, and potential impacts to facility operations as the deadline approaches.



Becentia Consulting Engineers provides targeted lighting redesign solutions that enable facilities to transition efficiently while maintaining operational continuity. Our approach focuses on maximising the use of existing electrical infrastructure, reducing the need for invasive upgrades and enabling faster, more cost-effective implementation.

However, a simple "like-for-like" replacement is not sufficient. Not all LED solutions are created equal, and poor luminaire selection can introduce issues such as glare and flicker—directly affecting patient recovery, staff performance, and overall safety. Careful specification is essential to ensure compliant, high-quality lighting outcomes suited to healthcare environments.

We work closely with facility operators to develop staged upgrade strategies that minimise disruption, protect uptime, and align with capital planning cycles. Early engagement also allows organisations to secure funding, prioritise high-risk areas, and avoid the bottlenecks that will inevitably arise as the 2027 deadline nears.

With less than two years remaining, proactive planning is critical. Facilities that act now will have greater control over cost, design quality, and delivery timelines. Becentia Consulting Engineers is ready to support healthcare providers with practical, compliant, and future-focused lighting solutions that ensure a smooth transition well before the phase-out takes effect.

Visit becentia.com.au

Proven performance, now backed for 20 years







For more than 40 years in Australia, iQ Homogeneous Vinyl has built a reputation for consistent, long-term performance in some of the most demanding healthcare and commercial environments. It is trusted by architects, designers and facility managers not for what it promises, but for what it continues to deliver in use.

That same iQ Vinyl is now backed by a 20-year commercial warranty.

This is not a change in product, but a reflection of performance already proven over decades in service.

Engineered for durability, iQ offers strong resistance to wear, scratches and stains, critical in high-traffic healthcare settings where performance cannot be compromised. What sets iQ apart is its ability to be restored without the need for chemicals, wax, polish or operational downtime, maintaining appearance and performance over time.

This ability to restore rather than replace is central to its long-term value, extending service life and reducing the need for replacement, along with the associated material, labour and operational disruption.

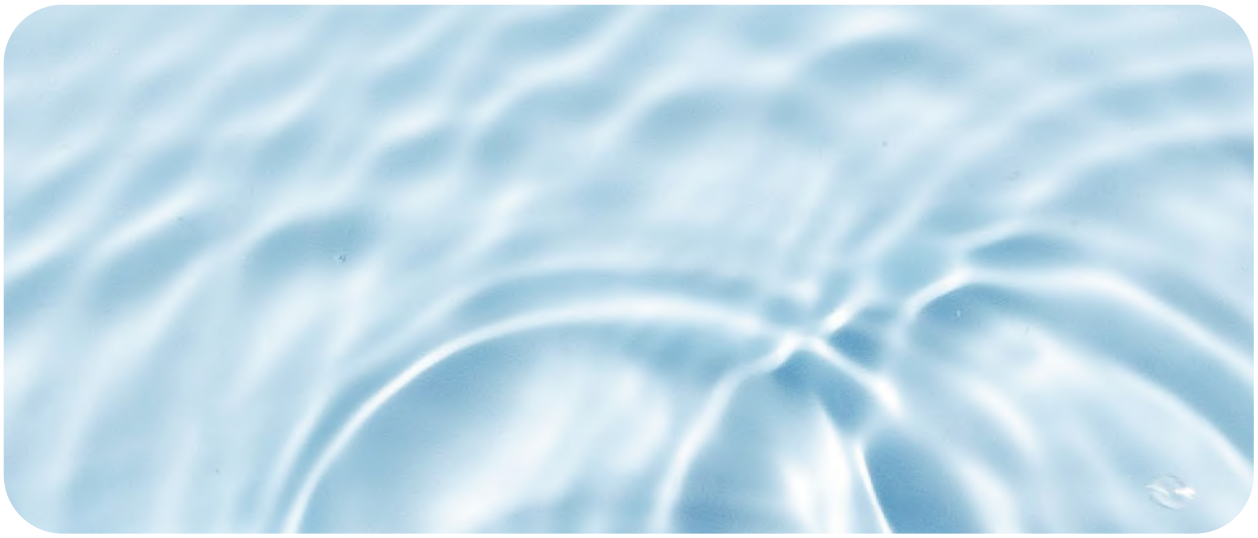
Extending product life also delivers measurable environmental benefits. By reducing the need for new materials and manufacturing, the overall carbon impact is lowered over time, making durability a practical pathway to sustainability.

Over its lifetime, iQ reduces the need for replacement, minimises maintenance requirements and limits disruption, supporting a lower total cost of ownership in environments where continuity is critical.

iQ. Proven performance, now backed by a 20-year warranty.

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