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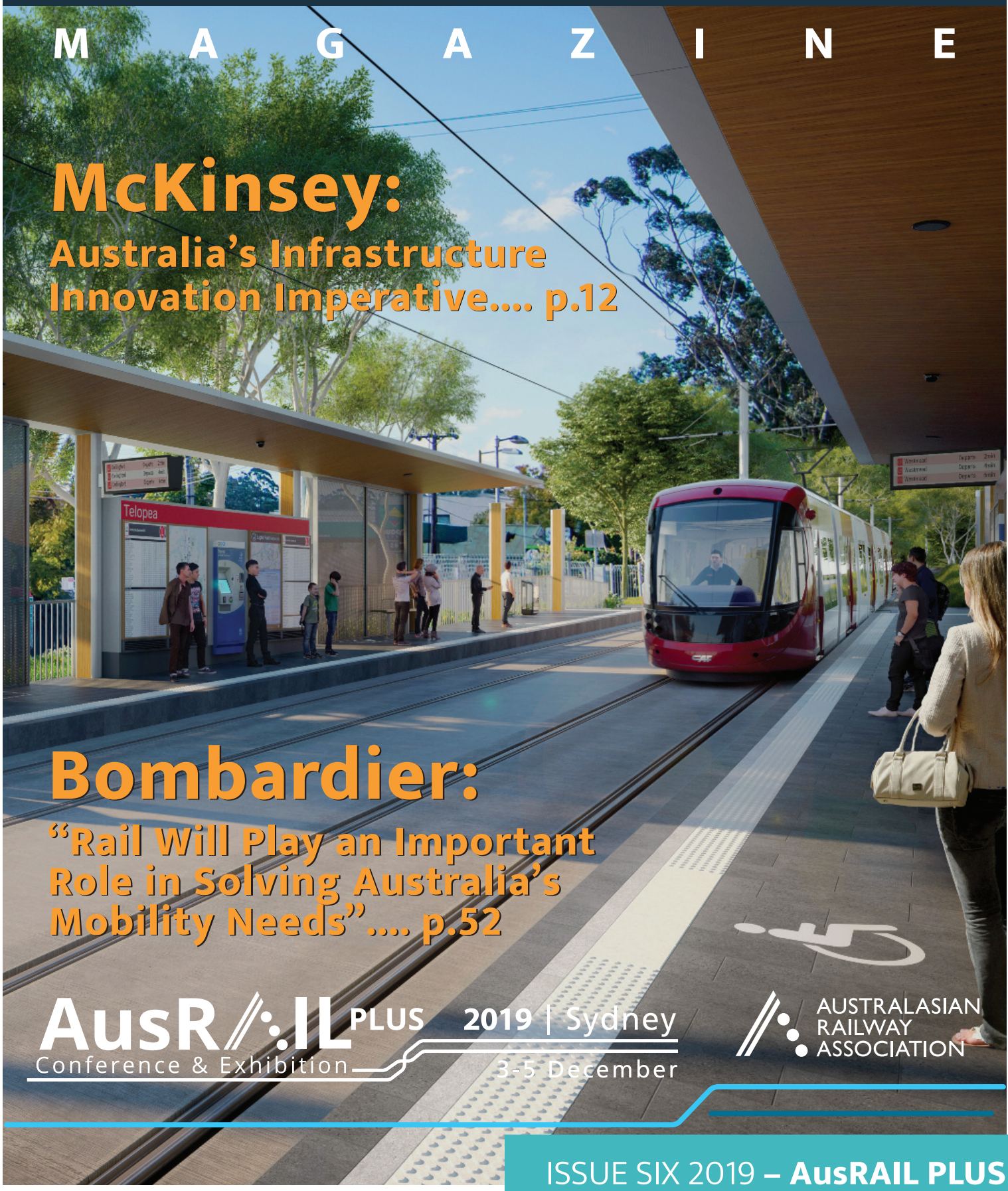
MAGAZINE

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AusRAIL PLUS 2019 | Sydney
Conference & Exhibition
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AUSTRALASIAN RAILWAY ASSOCIATION

ISSUE SIX 2019 – **AusRAIL PLUS**


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# Letter from the Editor


Josephine Cordero Sapién, Editor-in-chief

Dear Readers, the AusRAIL PLUS 2019 Conference and Exhibition, hosted by the Australasian Railway Association (ARA) in Sydney 3–5 December, is the biggest rail event in the southern hemisphere.

It is an important and timely event as Australia is undergoing a vast amount of infrastructure investment, from the federal and state governments as well as from private companies.

Just in May this year the first phase of Sydney's metro – Sydney Metro Northwest – opened to the public, with phase 2 – Sydney Metro City & Southwest – due to open in 2024 and tunnel construction already well underway. The New South Wales Government also earmarked 6.4 billion AUD for the final phase – Sydney Metro West – and fast-tracked the construction start date to 2020.

Other State Governments investing heavily too: the Victoria State Government is moving ahead with the Melbourne Airport Rail Link and the Suburban Rail Loop. The 11 billion AUD Melbourne Metro Tunnel is due to open in 2025 and features 9km twin tunnels to increase capacity in the city.

You can read all about the rail infrastructure projects in Sydney and Melbourne in our two dedicated Infrastructure Progress Report features. You can also find out about the Federal and State Government funding commitments for rail projects in their most recent budgets in our Policy Update.

We have surveyed government bodies, global consulting agencies, rolling stock manufacturers and trade groups about their views of the Australian rail market today, which together paint a comprehensive picture.

In this issue's Start-Up Corner, we hear from Stephanie Salter, Director at the Transport Digital Accelerator in New South Wales. The Accelerator aims at delivering great transport outcomes. One of its most successful programmes was its Mobility as a Service challenge, which resulted in several collaboration projects.

In 2020 we are publishing issue 1 on 9 March. It will focus on Rail Live! in Madrid. Following that our second issue will be published on 27 April in connection with Infrarail in London. And of course, 2020 is an InnoTrans year and we will publish two magazines around the show – with an event that big, one is just not enough. If you would like to be represented on our website or in this magazine, please contact Andrew Lush at **al@railway-news.com.**

Please enjoy our 6th and final issue of 2019!

*Josephine Cordero Sapién, editor-in-chief*

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If you would like to submit editorial content, or you are interested in giving an interview for the magazine, please contact **Josephine Cordero Sapién**.

If you would like your company to join Railway-News's online platform, please contact **Andrew Lush**.

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# AusRAIL PLUS 2019 | Sydney

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# Issue Six 2019 AusRAIL PLUS

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## *Editorial Features*

# AusRAIL 2019 Programme Tackles Growth, Opportunity and Technology

After months of meticulous planning, the Australasian Railway Association's (ARA) AusRAIL PLUS 2019, the southern hemisphere's largest rail conference, has released another diverse and informative agenda.

With the Conference theme 'Delivering Growth; Creating Opportunity; Embracing Technology' in mind, the agenda focusses on broad topics such as: making cities livable; supporting employment; and technology for the future.

Delving deeper, the event features several keynote addresses, panel discussions, technical streams and much more; including the exciting Young Rail Professionals Pitching Competition, which sees five rail industry professionals (30 and under) present their revolutionary idea to the AusRAIL audience.

"AusRAIL PLUS 2019 provides the opportunity for all sectors of the rail industry to come together and network in an environment conducive to engagement, discussion, learning and debate over three full days of informative speeches and panel sessions, technical presentations, networking dinners and exciting exhibits." Danny Broad, CEO, ARA

AusRAIL PLUS 2019 commences on 2 December with a welcome reception from 4pm giving delegates the opportunity to beat the morning rush the following day, pick up their conference passes and begin networking with other attendees in a relaxed environment.

The official day 1 of AusRAIL commences on 3 December with a welcome address from ARA CEO Danny Broad before Eleni Petinos MP provides a NSW Transport outlook. Prior to the first networking break, representatives from Sydney Metro, CFB Contractors, John Holland, UGL and Northwest Rapid Transit will hold a panel discussion regarding 'Delivering Innovation in Industry Partnerships' which primarily focuses on the new Sydney Metro and North West Rail Link.

Following the morning tea break, Bernard Tabary, CEO of Keolis Downer will speak to 'Innovation in Integrated Transport' before delegates hear insights into three nation-shaping project updates from Cross River Rail, Melbourne Metro, Perth's METRONET and NZ City Rail Link.

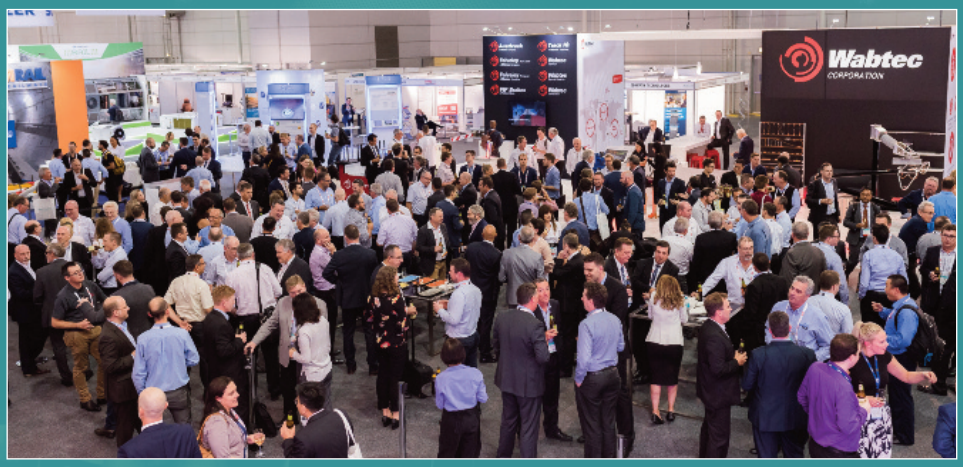
The Young Rail Professionals Pitching Competition completes the mid-morning sessions prior to the lunch break in the exhibition halls, giving all attendees the opportunity to vote for the most innovative pitch.

The conference programme will then split into five technical streams – RTSA, RTAA, IRSE, Rail Suppliers and the ONRSR, allowing delegates to choose the sessions that align with their areas of interest. The first full day concludes with exhibition networking drinks sponsored by McConnell Dowell.

Day 2 begins with an Inland Rail update from Richard Wankmuller before a special keynote presentation on the future of high-speed rail.

Two industry panels looking into supporting employment take us to the lunch break prior to four technical streams. The second day concludes with the first of the two networking dinners, the RTAA Yellow Tie Dinner sponsored by Bombardier, to be held in the Grand Ballroom at the ICC Sydney.

The final day of AusRAIL PLUS 2019 begins with an address from Bob Herbert AM, ARA Chairman, closely followed by a presentation on the benefits of digital transformation for rail freight from Deutsche Bahn. Back-to-back industry panels covering 'working with customers to make rail more competitive' and 'investment: what's needed to continue to fund rail infrastructure for the future?' take us




to the ARA Future Leaders Program Project pitches. Again, these innovative pitches from some of the brightest young professionals in the rail industry will be judged in part by the conference audience via the event app. Discussions on these exciting and worthwhile projects often continue through informal networking during the lunch interval.

Presentations in the afternoon session will delve into technology for the future kicking off with a look at rail's course towards a zero-emission future, before an industry panel wraps up proceedings. The conference concludes with the Gala Dinner, sponsored by Downer to be held at Luna Park Sydney.

## 400+ Exhibiting Organisations

In addition to the conference agenda, AusRAIL PLUS 2019 features the largest rail exhibition in Australasia. With over 400 organisations on display, visitors will need the full three days to take it all in.

Entry to the exhibition is free should you wish to browse. Exhibitors range from large multinational companies to small-medium local businesses all with interests in the Australasian rail industry.

Some of the organisations participating in the exhibition include Alstom, Downer, McConnell Dowell, CAF, Loram, Thales, ABB, Broadspectrum, CRRC, Faiveley Transport, Liebherr-Australia, Knorr-Bremse Australia and John Holland. The exhibition also features the Innovation Hub, sponsored in 2019 by Jacobs, where attendees can listen in on the exciting interactive sessions during exhibition opening times across all three days.

"Clear your calendar now and join us in Sydney, December 3-5, for AusRAIL PLUS 2019. This event is not to be missed!"

For more information and to book your place at AusRAIL PLUS 2019 visit:

**www.ausrail.com**

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# Zonegreen is on the Up Down Under

## Since 2016, safe working procedure rule breaches in Australia's rail industry have increased by 47%.

This concerning statistic was revealed in the Office of the National Rail Safety Regulator's (ONRSR) Safety Report for 2017–18, which also highlighted that one in six of these breaches posed a significant level of threat, including failures that could have resulted in workers being struck by a moving vehicle.

Depot worker safety is currently considered a national priority in Australia and an industry-wide safety improvement proposal has been announced by the ONRSR. With that in mind, ensuring that personnel at Melbourne's new maintenance facility, Pakenham East, were afforded the highest levels of protection was a priority for its operator Evolution Rail, a consortium comprising Downer Group, CRRC and Plenary.


Depots are inherently dangerous places to work, with hazards including moving trains and high-voltage equipment part and parcel of everyday life. However, advances in technology mean the risks to staff can be almost eradicated by removing the human element in safety procedures.

Leading this revolution are the specialist engineers at Sheffield-based Zonegreen. The firm is recognised as the creator of modern depot protection and its flagship system has now widely replaced traditional methods of safeguarding maintenance staff in the UK.

Working with Australian partner Andrew Engineering, Zonegreen's Depot Personnel Protection System (DPPS) has been installed at Pakenham East to ensure that depot worker safety in Australia continues to grow in line with the sector's ambition and the delivery of ground-breaking projects.

### Melbourne Moves Forward

Packenham is being constructed to serve the Victoria State Government's High Capacity Metro Trains project, which is introducing 65 bigger, better trains into Melbourne to meet its growing needs.

This is the second Australian depot to be equipped with Zonegreen's technology. DPPS was installed at Wulkuraka in Ipswich, Queensland, three years ago and the Bombardier facility retains an unblemished safety record. Unsurprisingly, Pakenham's operators were keen to introduce the same levels of staff safety.

The specification of Zonegreen's innovative system represented a great opportunity for the firm to demonstrate the power and flexibility of its technology to the Australian market, further extending its reputation across the country.

### Ground-Breaking Depot Protection

DPPS is a standard product that provides the safest and easiest method of controlling train movements in rail depots. It combines powered derailers, road end control panels, train detection

equipment, warning signals and personal datakeys to protect staff and infrastructure and is the most advanced, reliable and tested product of its type.

Zonegreen has spent many years on research and development, whilst listening to customer feedback, to ensure it moves with the times, makes the most of advances in technology and remains relevant in this ever-evolving industry. The result is a dynamic, intuitive, user-friendly system that allows depots to provide the highest standards of safety for staff.

By utilising modern electronics, DPPS provides excellent reliability and functionality and incorporates remote diagnostic features that make maintenance easier, expanding the lifetime of the product. Standardised software means that whilst the system can be configured to the unique layout of each facility, it is proven, tried and tested, so any updates or improvements can be rolled out with ease and minimal expense.

This innovative software reduces the cabling and electrical components required of DPPS, making it more resilient and able to withstand the rigours of a rail depot. It is based on an intuitive four-button graphical user interface that can be programmed in any language and has been designed to ensure future modifications or expansions are simple to undertake. Providing an overview of DPPS at Packenham is Zonegreen's monitoring, planning and analytical tool, Depot Manager. The software identifies where staff are logged on to the safety system and offers advanced traceability, by recording all actions, displaying the status of plant and equipment and delivering easy-to-interpret data that is accurate and readily accessible should an incident occur.


## Protection for Pakenham

Pakenham is being specially constructed to maintain Melbourne's new high-capacity trains and as part of the build process, Zonegreen has tailored its technology to the unique needs of the maintenance and stabling facility, which can accommodate 30 of the seven-car electric vehicles.

DPPS has been installed on 16 road ends within the main shed, ten of which boast physical protection via powered derailers. They are operated by road end panels, controlled by the system's personalised datakeys, enabling the safe and efficient passage of trains in and out of the depot.

The datakeys are programmed with varying levels of access, commensurate to the user's job role, and these levels of access allow staff to create safe zones in which to work. They contain advanced encryption, providing additional security.

Protection at Packenham has also been boosted by the incorporation of visual and audible warnings in the form of beacons and klaxons, indicating when vehicle movements have been authorised. In addition, DPPS is interfaced with the signalling system, preventing routes being set into the main shed if personnel are logged on to specific roads.

Zonegreen's Australian colleagues, Andrew Engineering, carried out the physical installation of the safety system and provided an interlocking solution linking DPPS to the overhead lines (OLE), preventing personnel and machinery from coming into contact with high-voltage equipment. They will also be undertaking routine maintenance.

## Looking to the Future

Christian Fletcher, Zonegreen's technical director, said: "We are really pleased to have been specified for Pakenham by Evolution Rail. The installation ran smoothly and we look forward to building a long and successful relationship with the depot. The project marks a significant milestone in our development overseas, helping us gain traction in another important export market."

The firm has recently celebrated DPPS's 20th anniversary by launching a new road end panel, which is operated via radio frequency identification (RFID) cards, which utilise a unique proprietary RFID reader that has been incorporated into the system. This latest version of DPPS also offers verbal warnings of vehicle movements, making it easier to distinguish areas of risk.

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# Australia's Infrastructure Innovation Imperative

## McKinsey discusses its 2019 report.


*Ishaan Nangia*


*Steve Joseph*

In September 2019 McKinsey published a report entitled Australia's Infrastructure Innovation Imperative.

It describes Australia as "among the most advanced economies globally in effective collaboration between the public and private sectors to deliver transport, energy and social infrastructure. It has also become a leader in private infrastructure investment [...]. The country spent around 1,177 AUD per capita on transport infrastructure in 2017, ranking second among Organisation for Economic Co-operation and Development countries [after Norway]."

Railway-News spoke to two of the report's authors, Ishaan Nangia, Partner, McKinsey, who is based in Melbourne, and Steve Joseph, Associate Partner, McKinsey, who is based in Sydney, about their findings.

**Railway-News: What is the significance of rail within the current Australian infrastructure context?**

**Ishaan Nangia:** "Over the past 15 to 20 years, Australia has been undertaking a significant public infrastructure programme, and there is approximately A$200bn more in the pipeline ahead.

"In particular, the programme has included public rail and metro 'mega-projects' to build capacity to meet population growth and modernise legacy rail networks in our major cities, including the $40bn+ Sydney Metro project, the $3bn Sydney Light Rail project, the $10bn+ Melbourne Metro project and the $3bn+ Cross River Rail project in Brisbane. Added to this is the $10bn Inland Rail project (Melbourne to Brisbane) to significantly increase freight rail capacity.

"Rail accounts for a large proportion of total major project spend. In some states it's well over 50%. Recent rail projects tend to drive attraction of market entrants and global expertise, development of the financing models and risk allocation, and evolution of new project techniques and innovations."

**RN: How do rail investments / projects differ from the other infrastructure segments?**

**Steve Joseph:** "Compared to road and social infrastructure projects, rail projects tend to have:

- **more construction and operating interfaces**

- more contractual interfaces (government vs operator vs contractor vs rolling stock provider vs systems provider etc.)_
- a higher degree of operational and system complexity
- a high degree of safety and regulatory requirements

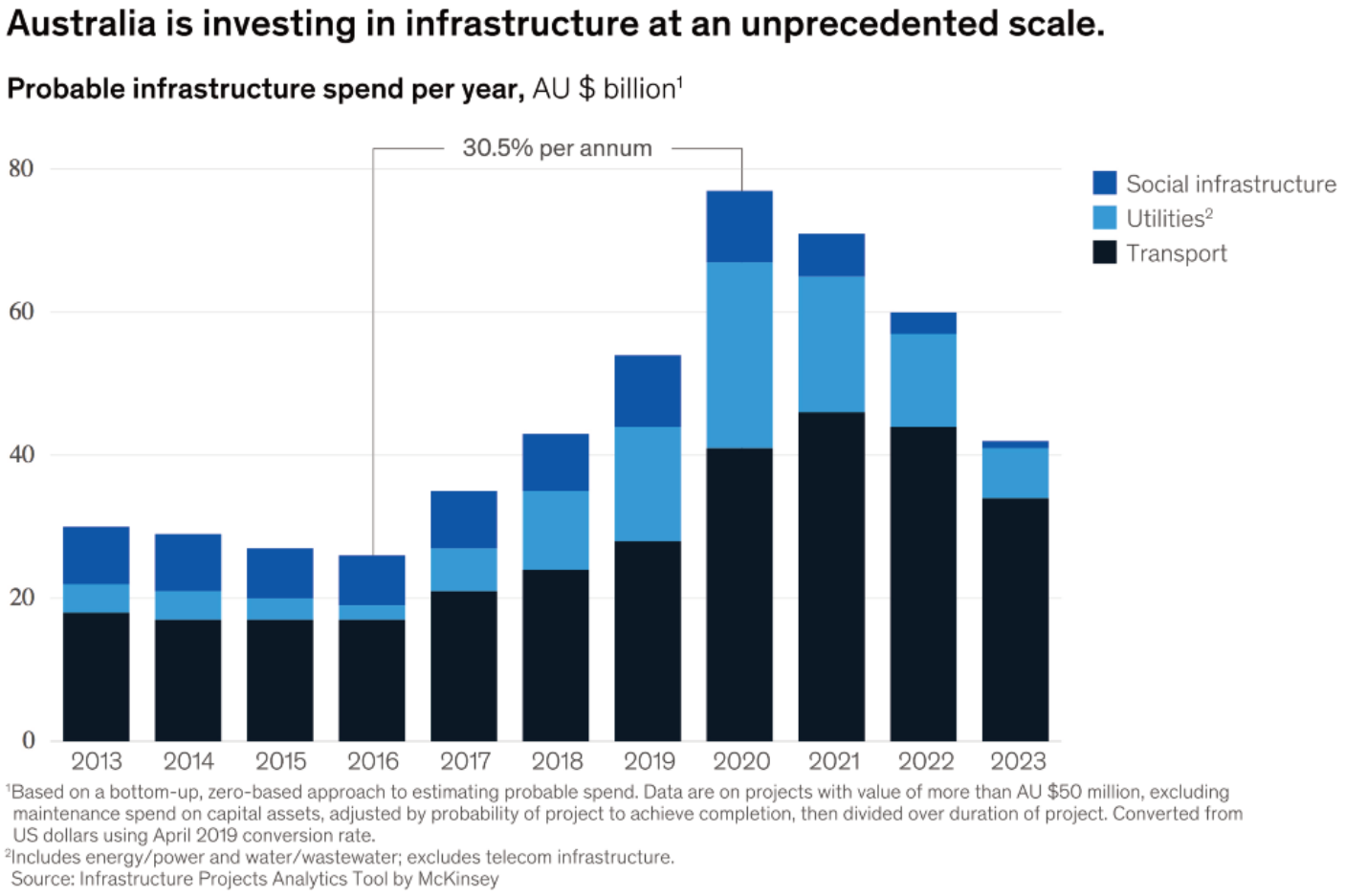
"And, 'mega-projects' often involve major tunnelling (as dedicated corridors no longer exist for network expansion)."

**RN: Are there aspects of rail infrastructure projects in Australia that are doing particularly well, which others could learn from?**

**Ishaan Nangia:** "As detailed in our recent report, we believe there are significant opportunities for innovation in rail and in other infrastructure sectors. These include the way that rail infrastructure projects are prioritised, planned, designed and delivered.

"Notwithstanding this, Australia generally performs well on a number of aspects of major rail project delivery, including:

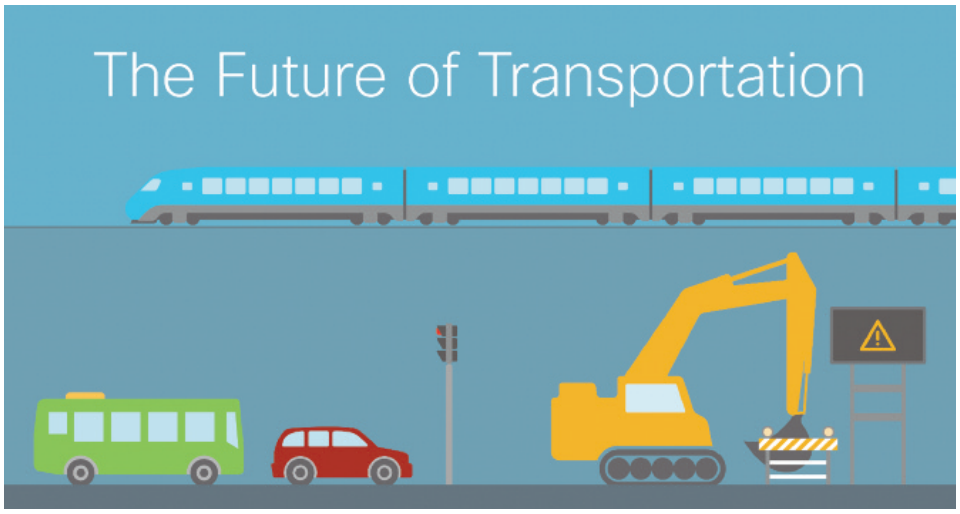
- completion of a detailed Environmental Impact Assessment process combined with the granting of special planning powers in relation to major projects, to enable construction to start expeditiously whilst still dealing with community and stakeholder concerns
- significant risk transfer to the contractor to enable innovation from the private sector and managing of risks
- high degree of safety performance in construction and operations
- establishment of project offices / project authorities (with a level of separation from the relevant government transport department) to enable better accountability and resourcing"



# The Future of Transportation

## By TJ Costello, Global Director for Cities, Communities, and Transportation at Cisco

With anticipation building for autonomous vehicles, buzz around ultra-high-speed transit options, and the growing presence of transportation devices that have an ability to communicate with each other, technology is fundamentally changing the future of mobility.




Throughout history, mobility has been an important driver for societal development: enabling economies to boom by facilitating faster, more reliable trade, higher standards of living, international investment, and larger globalised business operations. The future of transportation is set to deliver all of these outcomes and more. As the world becomes increasingly connected, so do transportation assets and devices, empowering communities and citizens around the world.


### Safety First

Arguably the most eagerly anticipated development in the transportation industry is the self-driving or connected and autonomous vehicle (CAV) which, despite perception, is set to increase passenger safety across multiple transportation modalities. Trains could very well be first out of the gate as fully autonomous forms of transportation. And the rail industry is making important strides toward driverless and eventually, autonomous trains. According to UITP, automated metro lines across the world reached the 1,000-kilometre milestone as of 2018. First, industry leaders will need to focus on interoperability to enable secure information-sharing between disparate unmanned systems, vehicles, and other system-wide networks. The capacity to manage autonomous train operations will support significant safety, efficiency, and productivity benefits for the rail industry.

Not only will these vehicles be driverless, they will have built-in artificial intelligence that can be programmed to monitor speed, maintain safe train control, and even mimic driving styles and behaviours perfected by human operators which can, for example, reduce incidents caused by extreme weather or

evolving trackside maintenance needs. And by connecting these trains to each other and to other IoT network devices, we can more intelligently use data to manage productivity, transit capacity, railway conditions, and safer mobility throughout our cities, communities, and countries.

## Empowering Mobility

Innovative technologies, like the IoT, have the potential to enable tremendous amounts of change. Interconnectivity and machine-to-machine communication supports train services proficiency, making train travel a more attractive mobility option.

This intelligence could also help to propel society towards a shared mobility model that is less about having your own personal vehicle, but rather treating mobility as a service – empowering people to be more productive during their commute times and enabling greater freedom and equal opportunities for those currently restricted by the inability to drive or fly.

It seems that we're at an inflection point, one in which the rail industry needs to adopt new technologies and operational processes in order to keep pace with the disruptors. If we don't figure out a sustainable way to attract more passengers to train travel, change the way trains run on tracks, and ensure trains arrive safely on time, the rail industry will not see itself move forward as a part of the future of mobility. This focus on passenger experience, and particularly the capability to increase commute productivity, is leading to the development of faster and faster modes of travel. Research and development continue into previously unexplored areas for maglev trains and hyperloop to potentially transform our travels all over again.

## The Bridge to Possible

Our customers often ask how they can prepare for these changes. We build Cisco Validated Designs to help customers take that journey with a tested and validated approach. But we must go further.

Today, our society relies so heavily on connectivity of devices and data exchange, it is no surprise that concerns about cybersecurity and privacy slow the adoption of these transportation innovations. How can we securely scale these technologies to empower cities and communities in the future and regulate the use of personal citizen data? It's time to put cybersecurity above everything else.


*Trains could very well be first out of the gate as fully autonomous forms of transportation. And the rail industry is making important strides toward driverless and eventually, autonomous trains.*

The rapid advancement of digitisation in transportation calls not only for greater commitment and collaboration across governments around the world, but also for the creation of a universal multi-modal transportation framework that will help to standardise the way cities and communities use, secure, and govern the data that is shared across transportation assets, infrastructure, and devices.

This will accelerate the actionable intelligence that will help governments to leverage and extend the opportunities for future travel beyond the examples above. With that kind of framework, we can broaden the way we think about and develop mobility innovations that truly transform the way we get people and goods wherever they need to be.

With these thoughts about the future of transportation, follow along with our #FutureofPublicSector series where we take a deeper look into some of the digital innovations around the world and how these are helping to change the future of the public sector.


# Transport for NSW: The Transport Digital Accelerator

*By Stephanie Salter, Director, Transport Digital Accelerator*

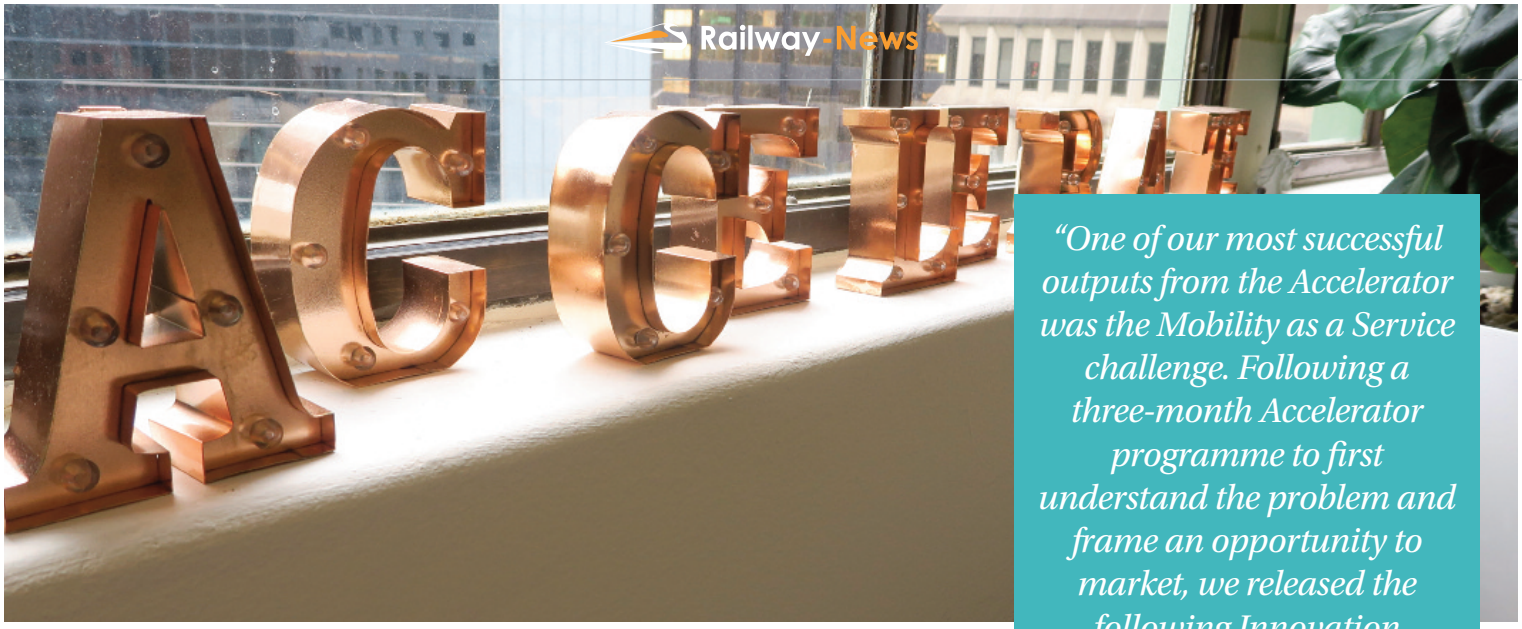
Establishing the Accelerator was a recommendation from industry during the 2016 Future Transport Summit.

Transport for NSW invited industry to co-design the Future Transport Technology roadmap, outlining what technology and customer outcomes are the priority in the next 5 to 10 years. Its purpose was to enable Transport to innovate in the digital and technology space and better engage with Industry & start-ups.

## *Who's Who at the Transport Digital Accelerator*

- **I started at transport in 2017 to design and deliver the Accelerator as a Director**
- **Brooke Knox started as Director of Partnerships in 2018**
- **Chris Bennetts was the Executive Director & responsible for the funding & initial concept of the Accelerator**

Transport for NSW are the architects of the first Government Transport accelerator model and our Accelerator is widely recognised as a



*"One of our most successful outputs from the Accelerator was the Mobility as a Service challenge. Following a three-month Accelerator programme to first understand the problem and frame an opportunity to market, we released the following Innovation Challenge: "How would you give customers optimal door-to-door mobility service options and seamless combinations for their situation, including the first and last mile?"*

model that delivers results. We facilitate direct collaboration between the public and private sectors, connecting teams from the NSW Transport cluster with industry, researchers, entrepreneurs and start-ups in the digital space.

In the past when Transport for NSW procured products and services, there was a tendency to publish Requests for Proposals (RFP) or Requests for Quotes (RFQ) with a specific list of requirements. This restricted the ability for industry to come up with innovative solutions.

For this reason, we now use the Accelerator to help better define customer problems & collaborate with start-ups and industry to find the right solution. This allows us to collaborate to come up with ideas we hadn't thought of and find new ways of solving complex problems.
We learned very early on that having senior leadership was critical for the success of the Accelerator. We are governed by the Innovation Leaders Panel, chaired by the Secretary of Transport, Rodd Staples & attended by Deputy Secretaries and senior executives across the Transport Cluster. It is this leadership that gives us permission to prototype, test and learn in a supportive environment. Their quick feedback is invaluable and ensures our work is aligned to our overall vision, customer needs, and priorities. Without this type of support, innovation is virtually impossible.

At the Accelerator, we use human-centred design to first understand the problem we are trying to solve before coming up with concepts and prototypes that solve these problems. We are always negotiating the balance between customer needs, technology viability and business objectives. Each project we deliver proves that spending time to research these three things results in products launched into market with higher long-term success. By embedding the understanding of customer problems into our solutions, we are building products that meet a real need, rather than building products with technology.... for technology's sake.

We have also published our human-centred design toolkit as a way to share our learning and encourage innovation across the sector.

We have had great success at the Transport Digital Accelerator due to a carefully crafted formula of People, Place, Process and Partners.

There a nine staff at the Accelerator. We have a mix of Service Designers, Innovation Program Managers & Partner Program staff. Our aim is to keep the team small and agile to allow for flexible and fast decision-making. We are empowered to run in an agile fashion, fail fast and learn, without negative implications. Our mission is to attract the best talent in industry. The opportunities are endless when you have a high-performing team motivated to deliver real change. Each staff member has a personal passion to make products and services better for customers of NSW public transport. This drive for change enables us to deliver quite a lot... with very little!
It was an intentional move to build the Accelerator space inside the Sydney Startup Hub. The building was established by NSW State government to encourage start-up jobs and growth. Physically working alongside diverse thinkers and emerging technology has greatly impacted our knowledge of the market & opened our thinking to new ways of working. It has also created new opportunities for smaller businesses to engage with a large government organisation as they have direct access to our team to

discuss their business objectives and share innovative solutions.

We have also established a strong partnership programme which is delivering great outcomes for both Transport for NSW and our partners. We have completed a number of trials/proof of concepts with our partners including:

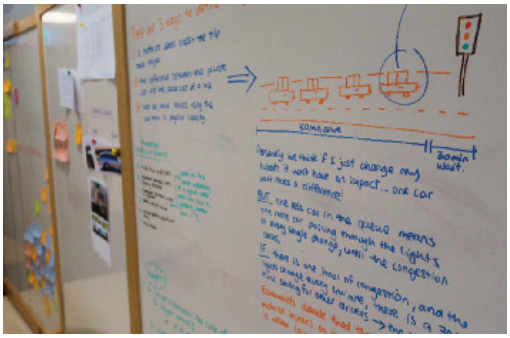
- **Google Bus on Maps: a global first with Google to show bus occupancy in the Greater Sydney area, within Google Maps.**
- **Co-development of enhancements to the Microsoft Soundscape App to enhance the travel experience for the vision impaired.**
- **A trial with Cisco involving the installation of an IoT device to transmit real-time data. The project leverages IoT concepts to demonstrate how new data insights can be obtained through sensor fusion.**
- **Co-development of a Customer Transport Simulator with PwC that provides a multi-modal simulation of customer journeys and network operations across the Sydney metropolitan region, allowing "what if?" analysis of potential future plans and scenarios.**

TfNSW is in the process of completing trials with technology start-ups, including:

- **Hyper Anna – an AI data analyst tool that enables us to ask plain English questions about Transport data.**
- **Building a decision support tool with Vizalytics Incorporated to provide train operators with greater insights into the occupancy of carriages to enable operators to make more informed decisions.**

One of our most successful outputs from the Accelerator was the Mobility as a Service challenge. Following a three-month Accelerator programme to first understand the problem and frame an opportunity to market, we released the following Innovation Challenge: "How would you give customers optimal door-to-door mobility service options and seamless combinations for their situation, including the first and last mile?" The Challenge has resulted in numerous collaboration projects between transport and wider industry. In particular, the following projects are currently in trial with both small start-ups and larger technology companies:

- **Tranzer by Sydney-based data analytics consultancy Lynxx is an app that allows you to plan, book and pay for all mobility options.**
- **Whim by Helsinki-based Maas Global, covers all your journeys and provides a simple pay-as-you-go option for travel and provides a subscription model.**
- **Uber is trialling new service offerings that link with the existing transport network.**
- **Swiftfare Fleet is a local start-up that delivers a service to provide a booking platform and live vehicle tracking to transport operators (including regional and rural communities) to integrate easily with real-time apps and websites.**



- **Skedgo is a Sydney-based start-up and a global leader as a MaaS enabler that will expand the number of transport options available for customers when planning their journeys.**

In 2019 we hope to further grow our concierge service, creating a better front door for industry to engage with Transport & encourage innovation and growth within the sector.

Our partnership programme is also set to grow and deliver more innovative solutions out to market.

In addition, we are focusing our efforts in Regional NSW to help deliver better transport journeys aligned to customer needs.

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# Engineered Leather – The Latest Chapter in Material Evolution

The history of materials is as old as human history itself. From the dried animal hides of the past, to today's engineered, innovative materials, they have certainly come a long way.

The leather industry alone has gone through stages of transformation. The earliest records of leather being used by humans date back to 1300 BC. Leather was no longer a by-product of hunting, but actually a material used in a range of ways. While the tanning process may have developed over time, today's leather remains fairly unchanged, although the industry has taken strides to become more sustainable, with the introduction of engineered leather.

The material industry has always been eager to transform the way it thinks and works. Changes in consumer attitudes have huge influence on this, and all of the material industry is currently trying to keep up with two consumer demands simultaneously: increased consumption and improved sustainability.

As the world's population continues to grow, so does the demand for rail and other modes of transport. As a result, the use of natural resources is increasing, and our climate is changing. However, consumers are also increasingly aware of their impact on this planet, and therefore look for more sustainable options. Ultimately, the goal must be to deliver what people want, and what the planet deserves: high-quality products and services, developed and produced responsibly and sustainably.

This opens the debate of what the best-possible material is for each aspect of a modern consumer's life. While often natural materials are preferable, the depletion of our natural resources begs the question of whether they are sustainable enough. The need to depend less on these resources is what has brought around the current wave of material evolution.

When it comes to seating, fabric is a common option. The issue with using fabric boils down to the high customer turnover rate on a train. Commuter trains travel up and down the country, transporting hundreds, if not thousands, of people every day. Fabric seats are hard to maintain and difficult to clean, which can compromise the travel experience of dozens of travellers in a single day.

One material offering durability, stylish appearance and passenger comfort is engineered leather. It uses leather fibre, giving it not only the same look and feel as traditional leather, but also the quality and comfort that comes from a raw natural material. It is also more sustainable than traditional leather as it utilises unused leather, diverting it from the landfill to create a new material. The totally unique and patented manufacturing process avoids using harmful adhesives in the fibre-bonding process – using only the power of water and also using significantly less water compared to other materials, recycling 95% of any water it does use.

Certain alternatives that have been classed as more responsible, or 'vegan', are often produced using mainly

synthetics and microfibres generally made of plastic, which are far from being biodegradable. This hampers their credentials for being environmentally responsible. Engineered leather, however, gives new life to a by-product that already exists and allows for greater design possibilities and higher performance.

*"Engineered leather is also more sustainable than traditional leather."*

In addition, engineered leather is easy to clean and maintain. It is finished with a coating which prevents any direct physical contact with the leather content for added durability and hygiene and eliminates the chemical cleaning requirement boosting environmental credentials for rail operators even further.

The history of materials proves that the planet offers a great range of natural resources. However, as consumer demands increase, it's vital that the material industry uses these resources in the most sustainable way – by making use of the world's precious resources with minimal impact on the environment.

*Sydney Harbour © chripell CC BY-SA 2.0*

# Infrastructure Progress Report:

## Sydney

**What:** Parramatta Light Rail
**Scheduled opening stage 1:** 2023

### *Project overview:*

The Parramatta Light Rail project in Sydney is a NSW Government infrastructure project that is broken down into 2 stages.

**Stage 1** will connect Westmead to Carlingford via the Parramatta CBD and Camellia. This will be a 12km two-track line. For 4km, the electrified line will be wire-free. These sections will be located between Westmead Station and Cumberland Hospital as well as between Prince Alfred Square and Tramway Avenue.

Estimates suggest that 28,000 people will use the light rail line every day by 2026 with 130,000 people living within walking distance of a stop.

Stage 1 will feature 16 accessible stops with services running 7 days a week at a headway of 7.5 minutes during peak times. Transdev will operate the line for 8 years with the option of operating the line for an additional 10 years.

### *Rolling stock:*

13 Urbos 3 light rail vehicles manufactured by CAF. The rolling stock will be driver-operated and have a capacity of 425 passengers. Each vehicle will be 45m in length. The maximum speed is 70km/h.

The vehicles will be fitted with roof-mounted lithium batteries – CAF's Greentech Freedrive technology – that are charged via the overhead lines and ground-level conductor rails at Westmead Station. This will allow the catenary-free operations.

In total, Stage 1 will cost 2.4 billion AUD.

**Stage 2**, which the NSW Government announced in October 2017, will connect Stage 1 and the Parramatta CBD to Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park. This stage will measure 9km in length. The NSW Government is considering the Final Business Case for Stage 2. An investment decision will follow.

### *Project status:*

The enabling roadworks are currently under way, having begun in January 2019. Major construction will start in

June 2020. The enabling works cover construction works such as relocating underground utilities, modifying and installing traffic lights, widening roads, redirecting traffic and making changes to parking.

Road widening works have begun on Hawkesbury Road, Westmead.

Starting on 29 November 2019 George Street in Parramatta between O'Connell Street and the Harris/MacArthur Street intersection will become a two-way road.

On 5 January 2020 the T6 Carlingford Rail Line will close permanently for construction.

From 1 February 2020 Church Street will become fully pedestrianised between Macquarie and Market Streets. A micro-tunnelling machine will construct the drainage.

## **What:** Sydney Metro City & Southwest **Scheduled opening:** 2024

### *Project overview:*

The Sydney Metro City & Southwest rapid transit line is a 30km railway line that is currently under construction. It will extend the Sydney Metro Northwest from Chatswood to Bankstown via Sydney's CBD. A second part of this project is converting the existing Bankstown railway line, which connects Bankstown and Sydenham, into a rapid transit line.

Of the 30km, 15.5km will run through a twin tunnel under Sydney Harbour to Sydenham. These will have an average depth of 25–40 metres.

There will be 18 stations in total, of which seven will be entirely new. They are Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Central, and Waterloo. Together with Sydney Metro Northwest, which opened in 2019, Sydney will have 31 metro stations over 66km in 2024.

### *Rolling stock:*

Alstom Metropolis six-car trainsets. The rolling stock is already in operation for Sydney Metro Northwest, which opened in May 2019. The stations are designed to allow for eight-car trains in the future. The electric multiple units have a seating capacity of 378 with a total capacity of 1,100.

Alstom manufactured the rolling stock in Sri City, India.

Sydney Metro services are operated by Metro Trains Sydney, a joint venture between MTR Corporation, John Holland Group and UGL Rail. This contract is for a 15-year period.


*Parramatta Light Rail at Telopea*
*© Parramatta Light Rail*


*Westmead*
*© New South Wales Government 2019*

## *Project status:*

The project received approval in January 2017, whereupon early works began. There will be five tunnel boring machines working on the project.

Current works include tunnel construction, as well as station excavation and structural works. Major excavation works are well underway at Central Station.

In September 2019, TBM Kathleen had completed more than 550m of tunnel under Sydney Harbour after launching in early August. TBM Kathleen is using compressed air to operate in the soft material found in this section. Following the construction of the first tunnel under the harbour, TBM Kathleen will be put to work on the second tunnel.

TBMs Mum Shirl and Nancy arrived at Martin Place in October. They are two of the TBMs creating the 15.5km twin tunnels.

In mid-October 2019 the twin metro tunnels were 70 percent complete, with the tunnelling works reaching Martin Place Station. TBM Mum Shirl has now broken through a wall of rock into Martin Place Station at a depth of 28 metres. It took around 21 months to excavate the cavern at this station prior to TBM Nancy's arrival. TBM Nancy is undergoing maintenance and will shortly re-launch to complete the last 1.3km section between Martin Place and Barangaroo.

*Telopea*
*© Parramatta Light Rail*

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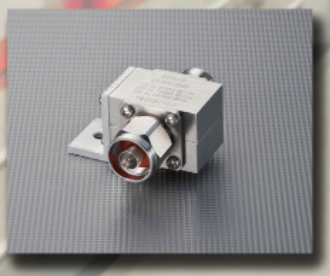

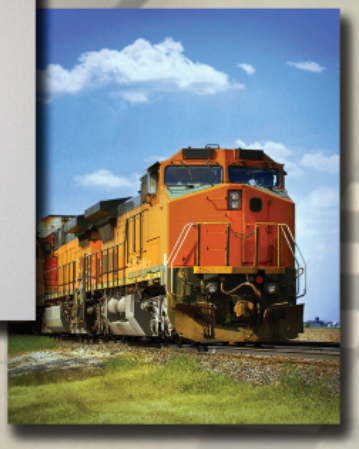

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# Connect with Passengers in Colour by Using Dynamic LED Solutions

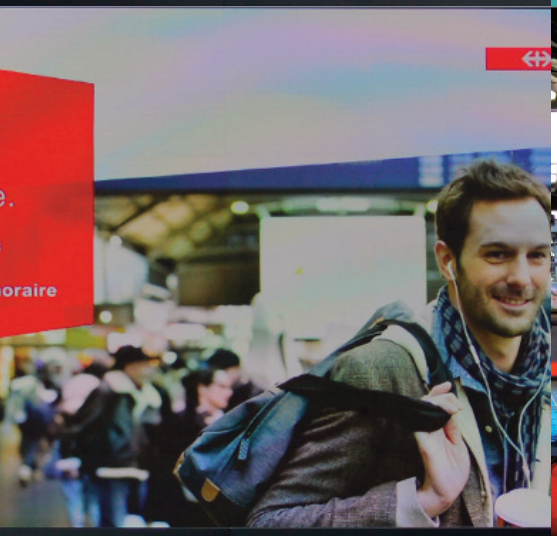
When travellers and commuters are moving about cities on a daily basis, they are looking around for directions to their platform, train or flight. They are actively looking for information that will help them reach their desired destination. That's where the opportunity exists to connect with them in a way that leaves a positive experience in their minds.

Using full-colour LED digital signage captures the attention of viewers and offers them a pleasant visual experience above and beyond the monochrome signage some are accustomed to in these applications. Stand out for your audience while helping them at the same time. This is where Daktronics shines.

Daktronics LED displays bring light and attention to real-time information for passengers while also providing a solid source of return on investment with advertising opportunities. In some cases, the advertising can even reimburse owners for the cost of the displays.

As an example of this digital signage in a real-world environment, look no further than Schweizerische Bundesbahnen (SBB), Switzerland's largest travel and transport company. SBB installed 50 Daktronics LED displays across 17 railway stations across Switzerland beginning in 2014, completing the final installation in 2018.

SBB was the first public transport company in Europe to introduce large-screen, central displays with LED technology of this scope across its network. It upgraded flip-digit displays to a full slate of LED displays that provide more flexibility, easier control and service, and clearer visibility of



customer information in its railway stations.

Each station has a minimum of two displays and up to as many as eight displays to connect with passengers throughout the location with pivotal information and additional messaging. In many cases, railway information is constantly visible on half of the display in real time, while the other half shows weather updates, news and advertising. This mix of content allows the station to realise a return on investment from advertiser revenue while constantly showing the critical travel information to its passengers.

The display technology incorporates excellent image clarity and contrast with wide-angle viewing for travellers to easily see and comprehend the messages shown. The full-colour nature of these displays catches viewers' attention for a pleasurable viewing experience, one that also appeals to advertisers. Having colour allows accurate representation of brand images and colours specific to brands and their products. Accurate colour reproduction helps emphasise a brand for a cohesive presentation from LED signage to their other video and print media efforts.

It's important to note that manufacturing quality matters when looking for these types of displays in this specific transportation application. Not every technology can deliver to buyer expectations.

"This is a very exciting project for Daktronics and we are pleased to provide SBB industry-leading solutions to assist commuters in receiving up-to-date, accurate information," said Rolf Bauer, Daktronics Regional Manager. "During testing phases, Daktronics was able to display everything the customer asked for and according to their specifications, providing them with confidence in our products. Daktronics will also provide SBB a lower total cost of ownership for the lifetime of the displays."


Higher quality with lower total cost of ownership is the goal. After receiving a quality solution, it can pay for itself in advertising revenue and last for years before needing replacement. This technology even lowers the cost from high-maintenance flip-digit technology.

One of the often-overlooked features of the digital LED video solution is the entertainment factor. In addition to providing all the information and advertising necessary for the application, this flexible technology has the ability to create an ambiance and entertain passengers while they wait for their transportation to arrive. With the click of a button, content can be changed to captivating imagery to make the trip more enjoyable for those passing through.

With all of these features and capabilities combined, it's easy to see why SBB selected the LED video technology for its railway network. It's flexible, easy to use, provides a captivating picture and is an upgrade over the previously technology, not to mention the return on investment. The switch from flip-digits to LED displays was a simple choice that pays dividends.

DAKTRONICS

*Adelaide-Darwin railway in South Australia © denisbin*

## The Department of Infrastructure, Transport, Cities and Regional Development on the key successes and challenges for rail in Australia:

"The opportunities and challenges facing Australia's freight and passenger rail industries are broad and far reaching. Transport infrastructure underpins the proper function of our economy and is responsible for the movement of more than 1000 billion tonne-kilometres of goods and bulk freight across the country each year. The Australian Government's $100 billion infrastructure pipeline recognises the importance of continued investment in our roads, air, sea and rail as a vital platform for economic growth and transport safety. To maximise the benefits from this unprecedented investment Australia's rail sector faces the challenge of attracting and retaining skills in a competitive labour market, but there are also opportunities to innovate, embrace new technology and harness the power of data to deliver better services for all Australians.

*"The Government has committed up to $5 billion towards the construction of a rail link to Melbourne Airport."*

"For the first time, a national approach has been agreed to position Australia's multimodal freight supply chains to face the growing freight challenges of the next 20 years and beyond. For passenger rail, the Government has committed to faster rail, providing for people to be able to commute from regional areas into the cities quickly and safely.

"The National Transport Commission has been tasked with developing an action plan to address skill/labour supply. With an aging population, the rail industry like many industries – is competing for a diminishing skilled workforce. The action plan will identify measures that can be taken immediately and map out a forward work program that is designed to support the unprecedented level of investment in the rail sector.

"In addition, the Government has developed the National Freight and Supply Chain Strategy and Action Plan to position Australia to meet its emerging freight and supply chain challenges. Inland Rail is a strategic investment in Australia's national freight network, one that will help Australia manage future demand from a growing domestic population and increasing international trade. Inland Rail will also connect productive agriculture regions between Melbourne and Brisbane with new markets and customers. The Government has also established the National Faster Rail Agency to deliver fast rail connections between major capital cities and their regional centres. This includes leading the development and implementation of the Australian Government's 20-year plan for a Faster Rail Network. The Government is also funding a range of business cases investigating options for faster rail connections between capital cities and regional centres and has committed $2 billion to deliver faster rail between Melbourne and Geelong.

"The Government has committed up to $5 billion towards the construction of a rail link to Melbourne Airport. The Melbourne Airport Rail Link will improve the performance of critical transport links to Melbourne Airport and Melbourne's north-west, and improve track capacity between Sunshine and Melbourne CBD.

"These initiatives taken together mean more Australians getting home sooner and safer and more of the products and produce we like transported to us by rail to us safer and faster than ever before."

# Optimising railway response times

Delivering a reliable and efficient journey experience for passengers is key for railway operators.

By moving away from a reliance on individuals, to the use of unified control rooms, operational resources can be efficiently managed, allowing for informed decision making and precise communication flows, improving safety and service continuity.

The answer? The integrated Public Transport solution from Frequentis satisfies operational as well as safety management system requirements.

Together the Frequentis Operational Communication System and Incident Management System support efficient day to day operations as well as prompt incident resolution, providing situational awareness, faster communication and efficient workflows, all aligned with the latest railway telecommunication standards.

With Frequentis technology operators are put back in the driving seat and customer satisfaction is improved.


*Scale model of a High Capacity Metro Train © Kb.au CC BY 4.0*

# Infrastructure Progress Report:

## Melbourne: Australia's Fastest-Growing City

**What:** Melbourne Metro Tunnel
**Scheduled opening:** 2025

### *Project overview:*

The 11 billion AUD Metro Tunnel in Melbourne will create a new rail line from Sunbury (west) to Cranbourne/Pakenham (southeast) that will operate high-capacity trains. The project includes the construction of five new underground stations (North Melbourne, Parkville, State Library, Town Hall, and Anzac) that will all be equipped with platform screen doors. The new tunnel will allow busy rail services to move off the existing City Loop subway and rail system, freeing up capacity for other services on the Loop.

The project includes twin 9km rail tunnels between South Kensington station and South Yarra that will run under the Yarra river.

As a result of the new Metro Tunnel, there will be a capacity increase of 504,000 passengers during each peak period.

The high-capacity (moving block) CBTC signalling equipment that will be installed will increase capacity from 20 trains to 24 trains per hour. The signalling will be delivered by the Rail Systems Alliance, a consortium comprising CPB Contractors, Bombardier, Metro Trains Melbourne and Rail Projects Victoria.

### *Rolling stock:*

Downer Rail – CRRC Changchun Railway Vehicles – Plenary Group (Evolution Rail consortium) High Capacity Metro Trains. The consortium won the contract in September 2016. These electric

multiple units will run in a seven-car formation that can seat 502 passengers and hold a maximum of 1800. They are being manufactured in Changchun in China, with final assembly taking place in the Melbourne suburb of Newport. The trains will be 160m long and run at a top speed of 130km/h. The original intention had been to have the new rolling stock serving existing lines on the City Loop from 2018 onwards, but this date has now been pushed back to mid-2020. Mainline testing should begin shortly. In total, 65 trains have been ordered for 2.3 billion AUD.

## *Project status:*

Construction began in 2018. Now, tunnel boring machines Joan and Meg have started operations on the North Melbourne to Kensington section after they were assembled at the new North Melbourne Station site in mid-2019. TBM Joan, which broke ground shortly before TBM Meg, has travelled more than 250 metres west from North Melbourne and installed more than 140 rings to line the tunnel.

TBM Meg has tunnelled around 50 metres towards the tunnel entrance in Kensington, installing more than 20 rings. The average speed of the TBMs is 10 metres in 24 hours. During the tunnelling operations, the mix shield TBMs will pipe the excavated soil mix back to a site in North Melbourne. At the same time they will line the tunnel with curved concrete segments.

TBMs Joan and Meg should arrive at Kensington in early 2020. They will then be transported back to the site in North Melbourne, where they will begin tunnelling towards Parkville and the central business district.

Two further TMBs will begin tunnelling in 2020. TBMs Alice and Millie will create the tunnel between Anzac Station and the eastern tunnel entrance.

## **What:** Melbourne Airport Rail Link **Scheduled opening:** 2031 (projected)

## *Project overview:*

The Victoria State Government has given the green light to progress the detailed Business Case for the Melbourne Airport Rail Link, selecting the Sunshine Route is the preferred option. This 27km route won out against three other alternatives as it demonstrates superior connections to Greater Melbourne and to regional Victoria. It also benefits from earlier deliverability. The route runs westwards out of Melbourne's CBD and would be integrated with the Metro Tunnel. Once it reaches Sunshine it then heads north to Melbourne Airport.

In April 2018 the Federal Government pledged 5 billion AUD for the project.


*Melbourne Metro Tunnel State Library Station construction site © Gracchus250 CC BY-SA 4.0*

Three months later the State Government announced it would match the federal funding with another 5 billion AUD.

It is estimated that Melbourne Airport will process 67 million passengers by 2038. Currently, the only connection to the airport is via a freeway. In comparison, Paris Charles De Gaulle Airport currently handles 69 million passengers annually and is served by two rail lines.

## *Rolling stock:*

Not yet known.

Project status: Stakeholder consultations began in July 2018 and are ongoing. The Victoria State Government also are undertaking early investigations such as what flora and fauna exist along the rail corridor, and what the cultural and historic heritage is along the line. Furthermore it is performing geotechnical investigations, utility surveys and inspections, and traffic surveys. The business case itself will be completed by Rail Projects Victoria in 2020. It will assess station and procurement options, value capture and creation opportunities and deliver an economic analysis of the recommended solution. The tender process was launched in mid-September. Construction is then to begin in 2022.

## **What:** Suburban Rail Loop
## **Scheduled opening:** 2050 (projected)

## *Project overview:*

The Suburban Rail Loop is broken down into several stages, and Stage 1, between Box Hill and Cheltenham is confirmed. A further stage would extend the loop to Broadmeadows to the northwest of the CBD and onwards to Melbourne Airport, reaching it from the north and complementing the Melbourne Airport Rail Link, which will reach the airport from the south. Finally, a third stage would run from Melbourne Airport to Werribee (in the west) via Sunshine.

Three new transport super hubs at Clayton, Broadmeadows and Sunshine will connect regional passengers to the Suburban Rail Loop. Of these, Clayton is part of Stage 1. As a result, people living in the areas surrounding Melbourne won't need to travel to the city centre to access jobs in the growing economic precincts outside of the CBD.

The Loop would traverse Melbourne's suburbs roughly 15–25km out from the CBD and run for approximately 90km. The cost estimate for the project is 50–100 billion AUD.

## *Rolling stock:*

Not yet known.

## *Project status:*

After the project was announced in August 2018, the Victorian Government committed 300 million UD for the planning, investigations and business case development for the Suburban Rail Loop in Melbourne. The project will be delivered by the Suburban Rail Loop Authority, which was established in September 2019. The stakeholder engagement process started in May 2019. Geotechnical drilling and environmental investigations began in Box hill in July and will continue throughout 2019 and 2020. The target start date for construction works on the southeast section is 2022.

*Melbourne Metro Tunnel Parkville Station construction site © Gracchus250 CC BY-SA 4.0*

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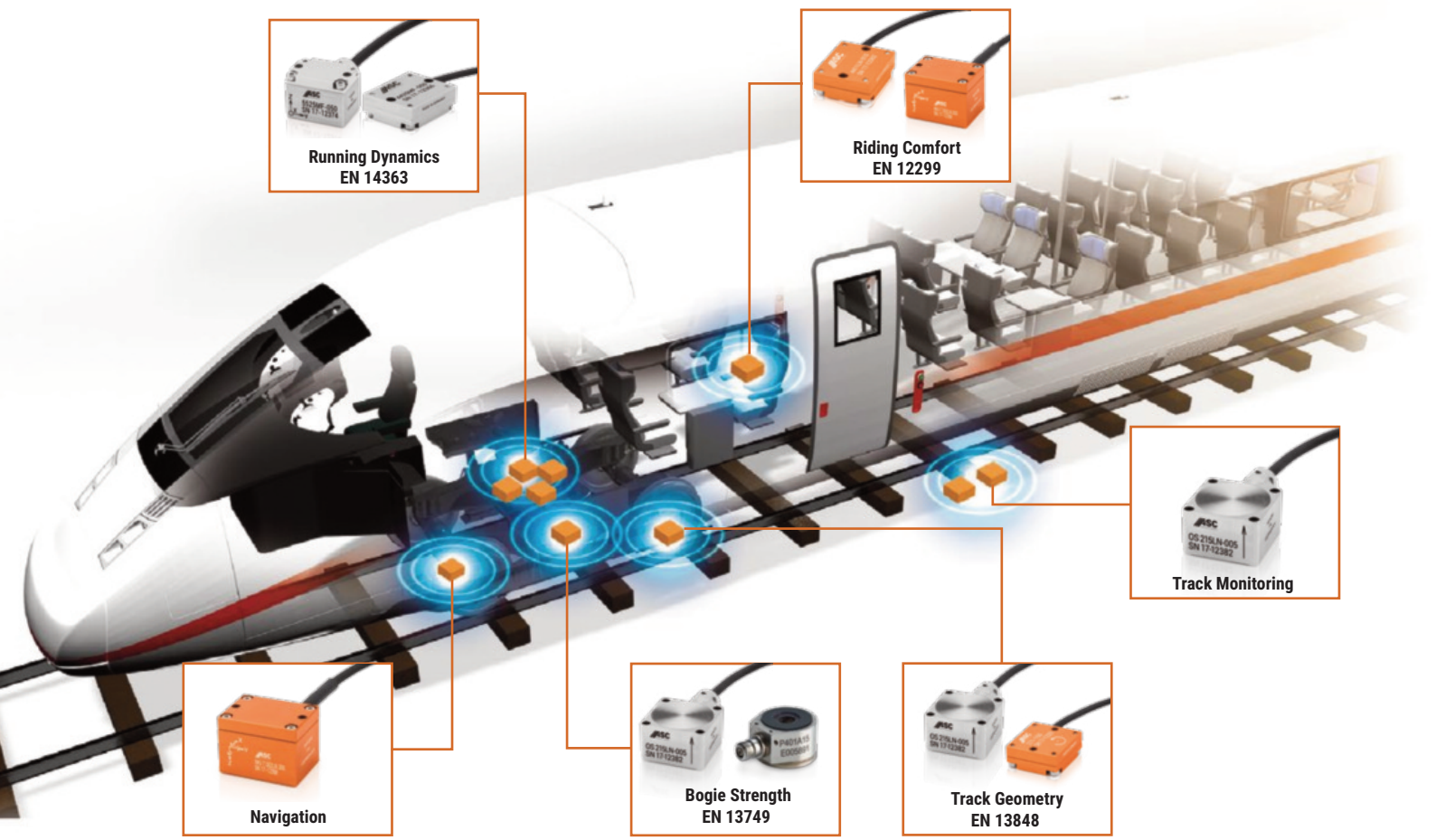


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# Measurement and Inspection Services – Accuracy at First Sight

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## Our Range of Measurement and Inspection Services Includes:

- **Ultrasonic for the detection of rail defects, such as transverse cracks and other internal defects**
- **Eddy current for the detection of head checks and squats**
- **Track geometry to document the track condition**
- **Longitudinal and transverse profile measurements, e.g. for the acceptance of grinding and welding works**

## The Benefits:

- **Prolonged lifetime of rails**
- **Predictive maintenance due to available track history**
- **Lower maintenance costs**
- **High availability of our large, worldwide pool of equipment and personnel**

## Ultrasonic Inspection Technology

- Compliant with EN 16729-1
- Ultrasonic inspecting is the most important non-destructive test for identifying internal rail defects (e.g. transverse cracks)
- Inspection is carried out with a hand-pushed trolley, acting as an economical substitute for test trains on short tracks
- The test report accurately documents rail defects and their position
- Early recognition of such defects allows rail breaks to be prevented because appropriate actions can be initiated

## Eddy-Current Inspection Technology

- Compliant with EN 16729-2
- The eddy-current test is an additional test to the ultrasonic method and is used to find crack-like defects on the rail surface (such as head checks), as well as the length and depth of the damage
- The inspection is carried out with a hand-held trolley, which checks both rails at the same time
- Following inspection, a report will be prepared detailing the condition of the rail
- Premature rail removal as a result of rolling contact fatigue can be avoided as a grinding action can be planned in a timely and predictive manner

## Track Geometry Measurement Technology

- Compliant with EN 13848
- Track geometry measurement includes amongst others gauge, check gauge, cross-level, rail transverse profile, twist as well as horizontal and vertical alignment. Additional infrastructure

information, including visual inspection results, can be captured digitally.

- Measurements are carried out using hand-pushed trolleys or gauges in different configurations
- You will receive a report with all the results of the route measurement
- These results allow for predictive maintenance planning and increased track availability

## Rail Longitudinal and Transverse Profile Measuring Technology


- Compliant with EN 13231/EN 14730-2
- The measurement of rail longitudinal profiles detects corrugation and slip waves as well as allowing for the acceptance test of welding and grinding services. By measuring the rail cross profile, the wear is documented.
- Measurements are carried out with measuring devices such as RAILSTRAIGHT or RAILPROFILE
- The measurement data allow for timely grinding work to avoid damage to track and vehicle components. In addition, these results serve to control and document the workmanship of joint welds.

# RIA on the UK and Australasian Rail Industries

**Neil Walker** Exports Director, Railway Industry Association

The UK and Australian rail industries have often worked together in partnership.

In March 2019, the UK's Railway Industry Association (RIA) and the Australasian Railway Association (ARA) announced a new partnership at a reception hosted by the British Consul-General in Australia, as part of a UK rail trade delegation visit of 12 UK companies to the region.

The new partnership will help cement the already positive relationship we have with the Australasian rail industry, maximising the potential of both industries and our respective member companies.

Both countries have much to offer the global rail market and RIA members also list Australia as a priority market.

With Australia's increasing population and economic growth, we have seen Australia's State and Federal Governments announcing high levels of spend on infrastructure and rail projects over the next decade, as they understand the power of the sector to move goods and people quickly and efficiently in a sustainable manner, while helping to cut congestion on the roads.

## *AusRail Plus*

RIA, along with a number of companies from the UK rail sector, has been forming UK Pavilions at AusRail Plus exhibitions over the past few years and are pleased to exhibit in Sydney again this December.

We would be delighted to welcome any visitors to the **UK Pavilion** at **Ausrail Plus 2019, stand number 95**.


*RIA at InnoTrans 2018*

www.nomad-digital.com

Nomad Digital

smarter trains, connected passengers

Rich Media and Web Portal

OBIS

Passenger Experience

Vehicle Connectivity

Trackside Networks

WiFi and Internet Access

Security-as-a-Service

CCTV

Real Time Management

Real Time Reporting

CBM

On Train Data Centre

Applications-as-a-Service

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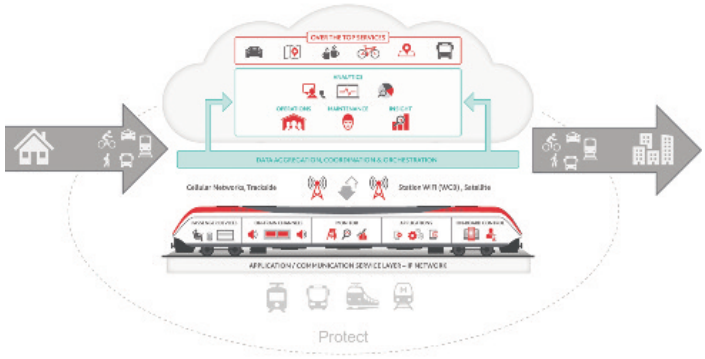
# Nomad Digital – Intelligent Transport

Nomad Digital is the world's leading provider of passenger connectivity and fleet-management solutions, for transport on the move globally.




We are dedicated to delivering an enhanced service, offering benefits to passengers and operators, by improving connectivity with our cutting-edge technology.

We have achieved success through innovation, skilled people and hard work, and our international impact is made possible by our people. We thrive on creativity and learning and remain committed to investing in and supporting amazing technology.

## Our Vision – Connecting Everything

"To be the world leader in connected transport, renowned for continuous innovation of technology and provision of quality solutions to deliver the intelligent journey."

Reliable connectivity has become an expected norm. When people are away from their home or office, being constantly connected is simply expected. Why should it stop when we step on to a vehicle? The answer is "it should not" and with Nomad it won't.

## State-of-the-Art Solutions

We offer a broad solutions portfolio to both transport operators and builders which facilitates a significantly enhanced passenger experience. The integration of Nomad's products and services into the on-board environment improves the passenger experience and delivers efficient technology, operating on one common platform.

We are completely focused on a seamless, smart and enjoyable journey for everyone.

## Start Your Intelligent Journey Today

Nomad is the pioneer of intelligent transport – a shared and secure network infrastructure to which all authorised on-board systems and passenger devices may connect and interact.

Our six key themes are the driving force behind Nomad's digital technology.

## Advise

Providing professional consultancy services and expert advice to help enable you to reach your organisation's goals and future vision.

## Connect

Enabling high bandwidth and reliable connectivity to the vehicle that passengers can use via multiple channels for a better experience.

## Engage

Providing high levels of passenger satisfaction through our web portal, with access to rich media content and real-time journey information.

## Interoperate

Enabling architecture and physical infrastructure to support and facilitate data and applications in a seamless way on the vehicle and to the shore.

## Insight

Allowing vehicle, operations and maintenance staff and other stakeholders access to real-time data to improve customer service, operations, capacity, availability and to reduce cost.

## Protect

The provision of services and tools to help aid the protection of your passengers and your brand, from a potential cybersecurity attack across your vehicle ecosystem.

## Enhancing the Passenger Experience

Nomad's ground-breaking vision from 2007 remains relevant today. Now, the opportunity is not just to connect the passengers, but also operators, maintainers and on-board staff.

Connecting to a wider base of stakeholders plays a valuable role in enriching the passenger experience, by responding to market needs and solving connectivity challenges. Passengers are crucial to the operating companies – yet guards, drivers, conductors, caterers and maintainers, all serve to enhance the passenger experience too. Bringing together passenger connectivity, information and entertainment will transform a passenger's experience.

## Intelligent Fleet Management

Providing transport operators with a real-time end-to-end solution – which integrates numerous on-board systems and components – is an ever-increasing priority as operators look for operational savings. Nomad not only provides remote connectivity, it also brings the know-how and tools to extract and understand critical operational data. This enables operators to perform real-time analysis on-board, automatically issuing alerts of impending equipment failures and feed the relevant information in real-time to the operations and maintenance departments. Using Nomad's powerful on-shore tool, historical diagnostic data is available for analysis at any time to support improved decision-making.

Intelligent fleet management is delivered by Nomad Tech, an innovative collaboration with EMEF, the Portuguese railway company for rolling stock maintenance. To find out more about Nomad Tech visit: nomadtech.pt

## A Global Player

Nomad currently serves global customers in more than 40 countries. Our technology is used by over 2 billion passengers annually, with solutions on more than 100 fleets, across 20,000+ vehicles, utilising 37,000+ passenger information screens, carrying 15+ million WiFi monthly sessions.

## What's Next?

The capabilities of on-board connectivity are endless, and through the adoption of industry standards, augmented with added-value Nomad interfaces and features, customers can be assured of a functionally-rich, future-proof platform, allowing everyone to be more connected than ever before.

# Innovative Train Detection Solutions

*Frauscher Wheel Sensors work highly reliably under various environmental conditions*

The Australian railway market has a growing demand for innovative solutions that support it in dealing with increasing requirements.

These range from challenging environmental conditions and rising train density on track to the implementation of new technologies and possibilities. At this year's AusRail, Frauscher Sensor Technology will present a selection of its products and latest innovations that enable the development of appropriate solutions.

## Covering Global Requirements in One Place

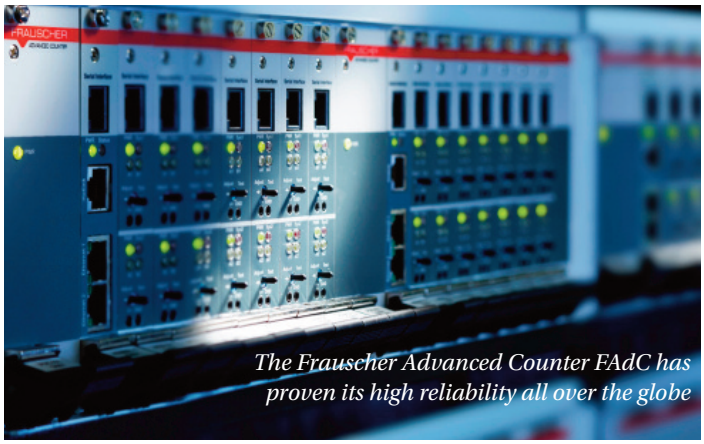
Travelling throughout Australia as a passenger gives you the possibility to experience tropical climate or deserts – as well as snowstorms and heavy rainfall. As inductive wheel sensors are state-of-the-art in terms of reliable train detection, they have to maintain maximum availability under all of these conditions. Frauscher has installed a global base of approximately 200,000 wheel sensors – which have proven their appropriate capabilities on all continents. Based on their robust design, their functionality is not affected by extreme temperatures, moisture or even floods, mechanical impacts or electromagnetic interference. Additionally, the possibility of mounting these sensors using a rail claw allows for quick installation without drilling – and weakening – the rail.

## Flexible Evaluation for Individual Requirements

*The Frauscher Wheel Sensor RSR110 can be integrated into individual applications simply and quickly*

The establishment of inductive wheel sensors in different regions and railway segments around the globe means that new areas of use are constantly being discovered. Due to its open, analogue interface, the Frauscher Wheel Sensor RSR110 can be integrated easily and rapidly into any infrastructure. Evaluation of the sensor signal can be realised by the system integrator or operator themselves. "This allows for the economic realisation of wheel detection-based applications, such as weighing, lubrication, imaging and others in different areas, for example depots or yards. To provide support if required, Frauscher has developed a Wheel Signal Converter WSC, which converts the analogue signal into a digital signal and creates the corresponding interface," said Lee Walker, Technical Support Manager at Frauscher Australia.

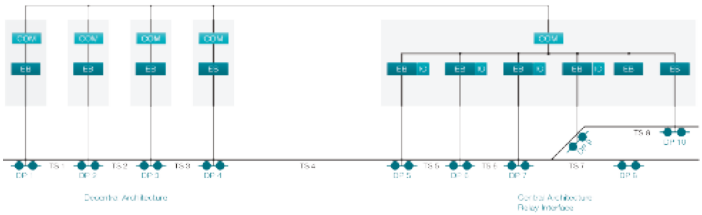
## Proven Axle Counter



*The Frauscher Advanced Counter FAdC has proven its high reliability all over the globe*

Other Frauscher Wheel Sensors, such as the RSR180, come in combination with evaluation boards, forming full SIL4 wheel-detection systems and axle counters. The Frauscher Advanced Counter FAdC provides flexible interfaces and high modularity. It allows for individual solutions to be developed in close collaboration with the customer according to project-specific requirements. Additionally, innovative functionalities, such as Supervisor Track Sections STS and Counting Head Control CHC can increase the system's availability even when unavoidable external influences occur.

"Connection to a high-performance electronic interlocking is possible both via a customer-specific interface and the freely available Frauscher Safe Ethernet FSE protocol. On that base, centralised architectures and decentralised architectures can be realised, as can a mixture of both. The Frauscher Diagnostic System FDS provides diagnostic data via remote access – which is extremely beneficial for



*Using the FAdC, mixed architectures can be realised to guarantee maximum flexibility in terms of individual requirements*

widespread systems. We have realised several projects using the FAdC throughout Australia. We look forward to seizing the opportunity at this year's AusRail to meet known customers and new interested experts to discuss experiences and requirements – and how we can support them in meeting them in future," said Mr Walker.

## New Intelligent Sensors

As a highlight, Frauscher will present its new SENSiS system. "We presented SENSiS for the first time at InnoTrans 2018 and were overwhelmed by the great interest and positive feedback. With a newly developed sensor, which works as an intelligent device on the track, this system sets new standards. The evaluation of the sensor signal takes place in the sensor – i.e. directly on the rail. Using a dedicated bus system, digitised data is transferred directly from the SENSiS Detection Point SDP to the SENSiS Processing Unit SPU in the indoor location. The possibility of building ring architectures enables immense savings by reducing the cabling required. In addition, the sensor is able to collect information on temperature and vibration. In the overall package, this system opens up completely new possibilities and represents the latest generation of track vacancy detection against the backdrop of an increasing digitalisation of the railway industry," Mr Walker summarised.

FRAUSCHER
SENSOR TECHNOLOGY

*The Frauscher SENSiS Detection Point SDP was presented at InnoTrans 2018, along with the SENSiS system*

*FLEXITY 2 Gold Coast Light Rail Vehicle © Bombardier*

# The Policy Update

## Australia's 2019 Federal & State Budgets

### *Australian Federal Government*

- In the 2017–18 budget under the Turnbull administration, the Australian Government established the National Rail Program, a 10-year investment programme to invest in passenger rail networks in the country's major cities, in the regions surrounding them and between them. The total sum allocated to this programme is 10 billion AUD.

- As part of the National Rail Program, the 2019–20 budget includes 3.5 billion AUD for the Western Sydney North South Rail Link.

The National Rail Program for 2019–20 also earmarks 2 billion AUD for fast rail between Geelong and Melbourne.

### *New South Wales*

- In the budget of June 2019–20, the New South Wales government said it was spending 55.6 billion AUD on more than 3,500 road and rail projects. Specifically, it earmarked 6.4 billion AUD for the accelerated delivery of the Sydney Metro West project, complementing Phases 1 (North West Metro) and 2 (City & Southwest). Construction for this

project is to begin in 2020. It will connect Greater Parramatta to Sydney's CBD.

- The NSW government has also committed 2 billion AUD over the next four years for the planning and preconstruction of the North South Metro Rail Link, which will connect St Marys to Western Sydney Airport via Western Sydney International. Construction is to begin in 2021 and completed in 2026 in time for the opening of the airport. This service, like the Sydney Metro, will operate fully automated, driverless trains.

- The Regional Rail Fleet project: 2.8 billion AUD for the design, build and on-going maintenance of the new regional rail fleet.

- A 295 million AUD investment over four years to deliver a fast rail network.

## Queensland

- In its State budget for 2019–20, Queensland said it would spend 5.6 billion AUD on road and transport infrastructure. These funds will go towards the continuation of Cross River Rail, a 10.2km line between Dutton Park and Bowen Hills in Brisbane. The State's total budget for the project is 5.409 billion AUD. It includes four new underground stations as well as two upgraded stations.

- 160.8 million AUD over four years will go towards the Beerburrum to Nambour North Coast Line railway duplication. The Australian government has committed an initial 390 million AUD towards the project.

## Victoria

- 12.3 billion AUD for major rail projects: Melbourne Airport Rail, the Suburban Rail Loop, and the Western Rail Plan.

Melbourne Airport Rail is a rail link from the CBD to Melbourne Airport via Sunshine. It will connect the state's regional and metro train lines, including the Metro Tunnel, to the airport.

The Suburban Rail Loop is a 90km rail line circling Melbourne's suburbs. It will have 12 new underground stations that will connect every major rail line from the Werribee Line to the Frankston Line.

The Western Rail Plan aims at the full separation of regional and metro rail services on the Geelong and Ballarat Lines.

- The Victoria State budget has earmarked 6.6 billion AUD for removing 25 of its most dangerous and congested level crossings, with 75 such crossings gone by 2025.

- It is also investing 3.4 billion AUD in transforming its suburban rail network, with large-scale upgrades to the Sunbury Line, duplicating the Cranbourne Line, and Stage 2 of the Hurstbridge Line.

- 163 million AUD for new and upgraded trams. And 195 million AUD for additional train services.

## South Australia

- 615 million AUD for the Gawer Rail Electrification project. This budget also includes purchasing additional electric rolling stock.

- 125 million AUD for extending the Tonsley Rail Line to Flinders Medical Centre and Flinders University. There will be an elevated single track over Sturt Road, Laffers Triangle and Main South Road and a new station next to the Flinders Medical Centre.

- Level crossings: 231 million AUD over three years to abolish the level crossing at Torrens Road in Ovingham; and 171 million AUD to achieve grade separation of the Seaford Rail Line Brighton Road, Hove.

## Western Australia

- 4.1 billion AUD towards building METRONET for Perth and surrounding regions. Major METRONET projects are already under way, with 3 major METRONET projects to start in late 2019. In total, there are six rail projects already ongoing or in planning that measure 72km in length in total. 246 METRONET rail cars are being built in WA.

- METRONET: 420 million AUD for the Yanchep Rail Extension to extend the northern suburbs rail line to Yanchep. The Western Australian Planning Commission will contribute a further 100 million AUD.

- METRONET: 535.8 million AUD for the Thornlie-Cockburn Link, which will extend the Thornlie line to Cockburn. The project includes the construction of two new stations.

- METRONET: 1.6 billion AUD for the acquisition of new Transperth railcars and A-Series replacements. 246 railcars in total will be procured. Of these, 102 will go towards METRONET Stage 1 projects, while 144 will be used to replace existing A-Series rolling stock. The new trains will be six-car sets, compared to the current three-car sets.

- METRONET: The Forrestfield Airport Link is a 1.9 billion AUD project. The 2019–20 budget has earmarked 315 million AUD towards the project.

## Tasmania

- Tasmania doesn't have any passenger rail services. However, TasRail, a State Government-owned enterprise, operates the state's mainline railway lines for freight services. Tasmania has committed to the Tasmanian Rail Revitalisation Program to remediate the state's rail freight network. In the State 2017–18 budget, Tasmania promised 59.8 million AUD over four years starting in 2019–20 to begin Tranche 2 of the programme. The State and Australian Governments have each committed a further 68 million AUD towards Tranche 3, commencing in 2021–22.

- Tasmania will also contribute 575,000 AUD to TasRail, towards the construction of a weighbridge at Parratah in 2019–20.

*A-City Class 4000 Adelaide commuter train © Bombardier*

# MOBILE INDUCTION RAIL WELDER

- Deployable from lightweight RRV, Truck or Trailer
- Automatic Peaking & Alignment
- Rail Stressing Capabilities
- Automatic Shearing
- Compact for S&C installations
- Poka-Yoke – error proof welds
- low rail consumption
- Bend strength CEN56 – In excess of 1330kN minimum. C 1600kN +
- Bend test properties similar to parent rail material in the absence of a weld
- Microstructure: As parent rail with slight increase in hardness
- Heat Affected Zone: without oxidation or flaws.
- Low risk of ignition
- Low power, emissions & noise

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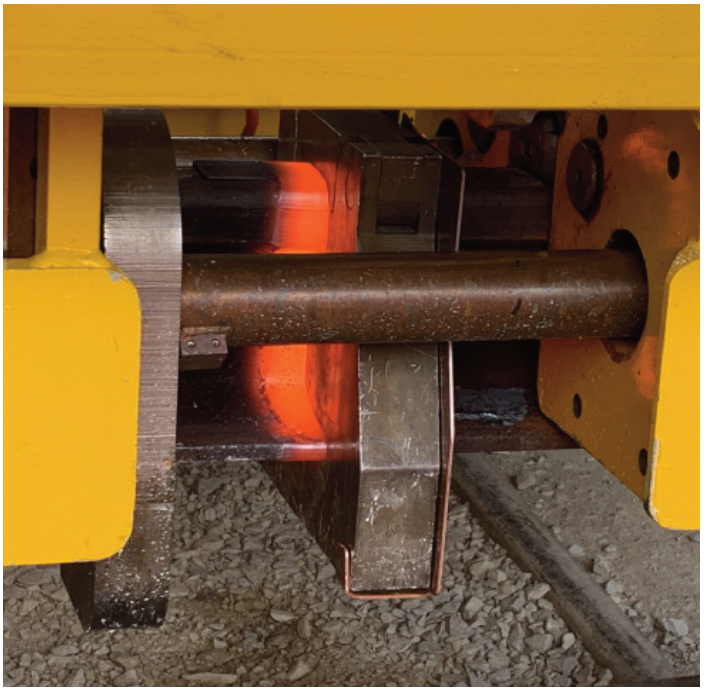
# Mirage Rail Goes Global with Rail Induction Welding System

An innovative new rail welding system from Mirage Ltd has been hailed as a "game-changer" for railways across the globe.

The induction welding system, developed for Network Rail in the UK, is now being introduced to the Australian market at the AusRAIL Plus 2019 showcase.

Having built a prototype, Mirage turned heads when it demonstrated the system for delegates at the UK's outdoor Rail Live 2019 exhibition.



Mirage Managing Director Nick Mountford said the collaboration between Network Rail and Mirage to develop this system was described as a "game-changer" by senior rail professionals.

Mr Mountford added: "Delegates were able to witness for themselves the process of automatic rail alignment and in-track induction welding. The entire welding process takes just a few minutes to complete and is proven to be both repeatable and safe."

Having developed systems for European Norms (CEN 56 & 60 rail profiles), other profiles are being developed including one for the Australian market.


**There are many benefits to the Mirage Rail Induction Welding System. They include:**

- **Deployable from light-weight RRV, truck or trailer**
- **Built-in peaking & alignment**
- **Rail-stressing capabilities**
- **Automatic shearing**
- **Compact for S&C installations**
- **Poka-yoke – error-proof welds**
- **Insert welding to reduce rail consumption to near zero**
- **Bend strength CEN56 – in excess of 1330kN minimum. C 1600kN +**
- **Bend test properties similar to parent rail material in the absence of a weld**
- **Microstructure: as parent rail with slight increase in hardness**
- **Heat-affected zone: without oxidation or flaws**
- **Low risk of ignition non-sparking process**
- **Low power, emissions and noise**

"The Mirage Induction Welding System is a major stride forward in track-laying technology," said Nick. "We have worked hard to minimise environmental and safety issues, for example, there are no gas cylinders or hoses required for pre-heating and this minimises the risk of fires on site.

"The energy consumption used during operation is low (150KVa), while process monitoring is built in with automatic data logging. The Mirage system produces quality welds at a strength well in excess of standards applied by Network Rail in the UK."

Mirage is a design and build house with over 10 years' experience producing bespoke machinery and engineering solutions for the rail, automotive, pharmaceutical and food industries.

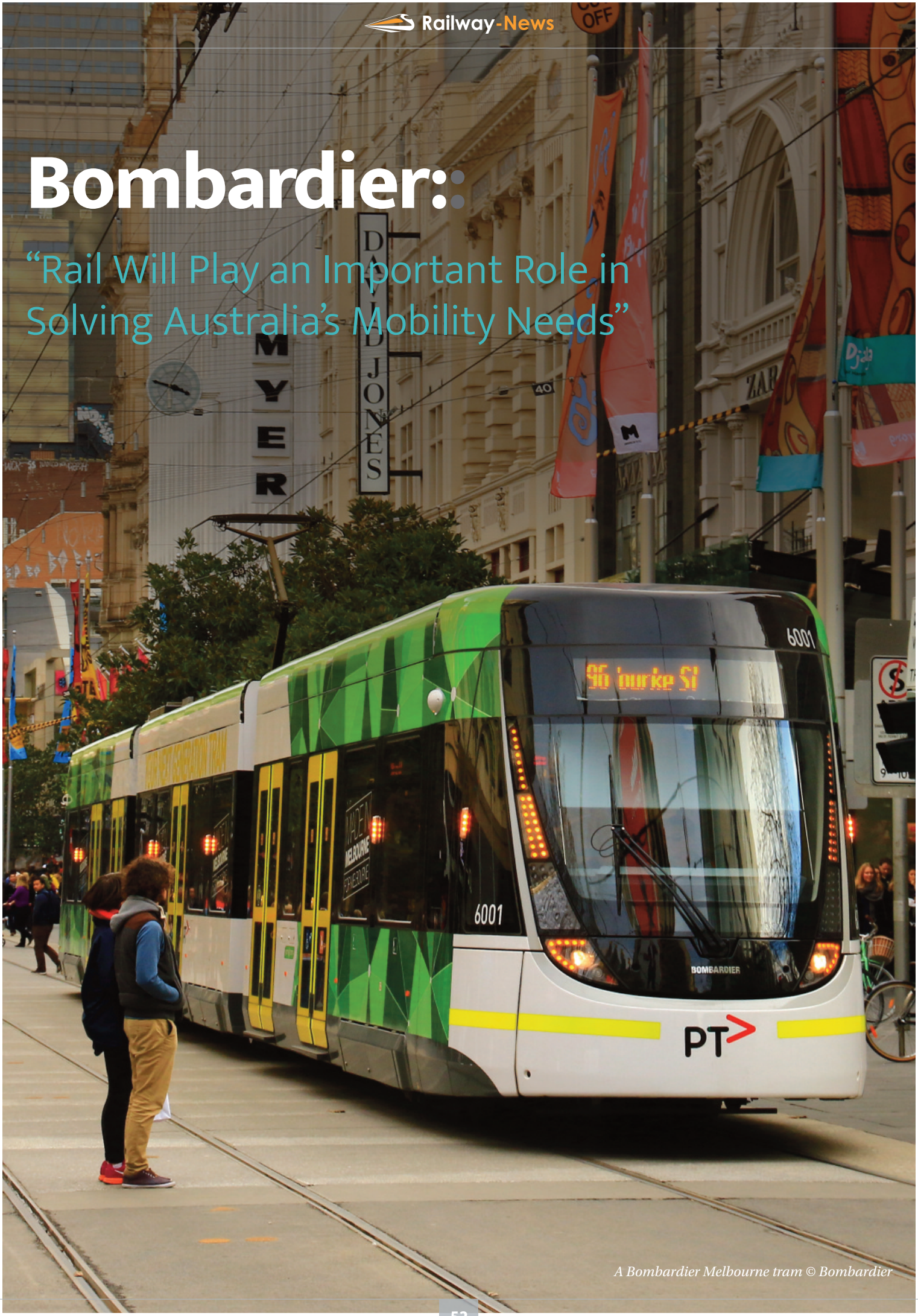
The company, based in Staffordshire, England, has an experienced design department equipped with solid, surface and 2D modelling software to assist in the design and development of innovative, reliable, bespoke solutions for our customers requiring automation in the rail industry.

Mirage's lean manufacturing equipment incorporates various technologies which are integrated into the finished solution. Flexibility in handling a variety of products and combining manual and automatic operations is a critical factor in the success of Mirage's products and equipment.

**www.mirageservices.co.uk**

# Bombardier::

## "Rail Will Play an Important Role in Solving Australia's Mobility Needs"




*A Bombardier Melbourne tram © Bombardier*

Australia is investing greatly in its infrastructure, including its rail network, both in urban settings, such as with the expanding Sydney Metro, and with inter-urban lines, such as the Inland Rail project between Melbourne and Brisbane. As a result, it's no surprise that the Australian rail market has attracted the attention of suppliers in the sector, with all the major rolling stock manufacturers receiving orders.

As a sponsor of this year's AusRAIL PLUS, Bombardier Transportation is demonstrating its support for the Australian rail market.

**Railway-News: "What are Bombardier's activities in Australia?"**

**Bombardier:** "As a trusted rail industry partner with over 1000 employees, Bombardier designs, engineers, manufactures and maintains rolling stock across Australia, along with providing signalling, rail equipment, asset management and through-life support to customers and operators.

"Bombardier has been investing in Australia for the last 70 years and we are proud to say that currently, we are the only rail manufacturer in Australia with the ability and capacity to singlehandedly manufacture trains and trams in Australia. We have industrial design, engineering, manufacturing, maintenance and rail signalling teams based in Australia allowing us to maintain the highest level of local content across majority of our projects."

**RN: "What will you be focusing on at AusRAIL?"**

**Wendy McMillan, President, Southeast Asia and Australia Region:** "We are proud to present Bombardier's latest innovations for sustainable mobility at the AusRail Rail Conference and Exhibition 2019.

"We will discuss with customers, operators and government officials; our complete value chain of high-performing mobility solutions for Australian cities including trams, commuter trains and light rail applications as well as our full scope of services and signalling systems which have been helping our Australian customers minimise their operational costs and maximise revenues for decades.

"Bombardier is proud to forge long-term partnerships in Australia, built on a strong track record of delivery performance, best-in-class rail technology and value-adding long-term solutions; which has laid the foundation to further support

*Wendy McMillan*

Australian Governments great efforts to meet a higher demand for public transport to ensure the comfort and ease of every passenger's journey."

**RN: "How do you view the strong infrastructure investment Australia is currently experiencing?"**

**Bombardier:** "Australia also has an opportunity to become a major rail manufacturing hub with a strong focus from the government to invest in local content and railway infrastructure, including new trains, signalling systems and maintenance. Rail will play an important role in solving Australia's mobility needs, and Bombardier Transportation is keen to apply its local experience with global expertise to propel the country forward.

"As the cost of energy and the need to improve efficient performance are challenging rail operators globally, Bombardier is playing a key role in shaping sustainable mobility for the 21st century. "Responding to our customers' needs, we are delivering cutting-edge products to rail operators to optimize efficiency and environmental performance.

"Rail is the only sustainable transportation solution to many of today's environmental, social and economic challenges and Bombardier is looking forward to continuing to safely move millions of people across Australia."

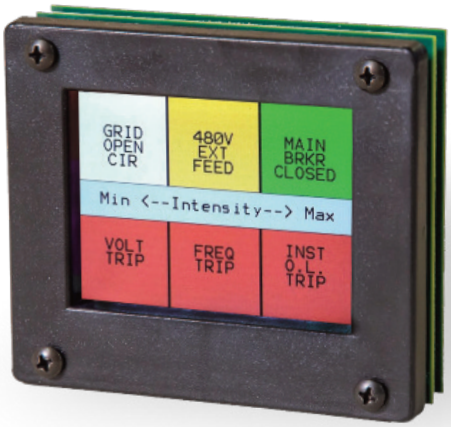
*Australia also has an opportunity to become a major rail manufacturing hub with a strong focus from the government to invest in local content and railway infrastructure, including new trains, signalling systems and maintenance.*


*Gold Coast FLEXITY 2 © Bombardie*

# Dina Consulting & Design, LLC

## Innovator of Cutting Edge Locomotive Solutions

**Dina Consulting & Design provides specialized solutions for the railroad industry through New Product Design, Locomotive Consulting, and an extensive Parts & Service department.**




### LCD Indicator Light Panel *LCD-1201916*

This device monitors locomotive health. It can display faults from the engine or any other control system encountering problems. The engineer will be shown all necessary warning conditions during operation. This panel is a direct replacement for the EMD "egg crate-style" indicator light panel.

It can be installed in the High-Voltage Cabinet, the Control Stands, Auxiliary Cabinets or the Head-End Power cabinet. Thanks to the adjustable liquid crystal display, the system is suitable for both low and high-lighting conditions. Has a touch-screen interface and is fully programmable.

### Locomotive Layover Battery Charger *LCD-1205100*

**480VAC / 575VAC to 74VDC**

This railroad grade battery charger can easily be adapted for any model locomotive to maintain batteries fully charged without running the diesel engine. The small package size accommodates both retrofit and new application installation, and it's also able to charge both NICAD's and Lead Acid batteries. A simple wayside connection to 480/575 VAC and the Layover Charger is self controlled and protected. This Layover Battery Charger is a direct replacement for the KBC battery charger product line installed on most MP style commuter locomotives.


### Locomotive Isolated Power Supply *LCD-1201375*

**74VDC–24VDC 33A DC to DC Converter**

A power supply for electric windshield wipers. Also suitable for application of engine controllers (ECM's) requiring 24VDC and DEF line heaters.
The nominal operating input voltage is 43–85VDC. This compact unit can be easily installed in the Head End Power cabinet, High-Voltage cabinet and shortnose. Comes with low-voltage dropout protection set at 29VDC.
It can run continuously with zero load, there is no load required.
We also offer a 50A version of this Power Supply.

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**With a constant focus on our customers, DC&D is striving for innovation in our industry, while continually embracing the integrity of our past.**

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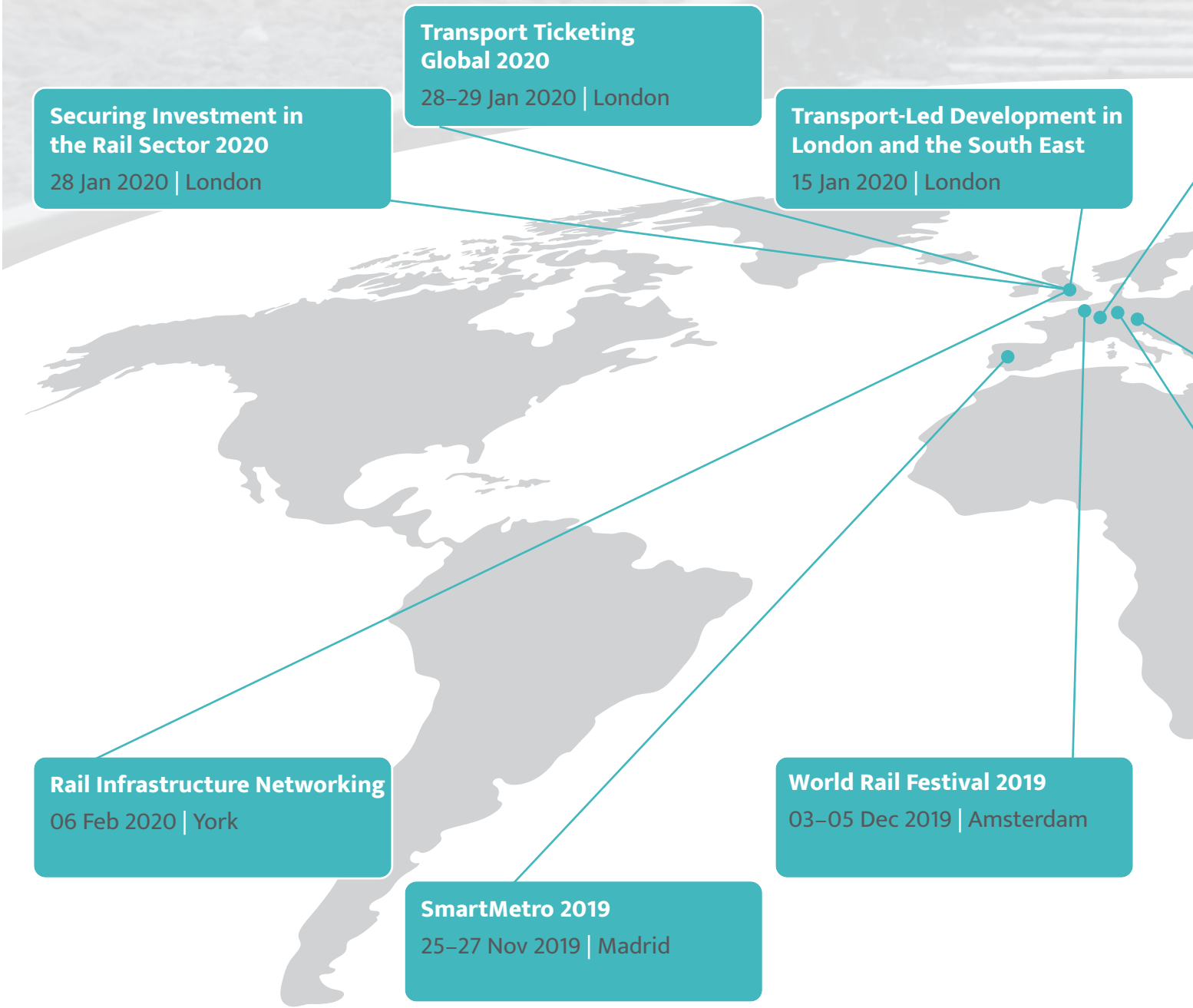
# Upcoming Railway Events & Exhibitions

## November 2019–March 2020



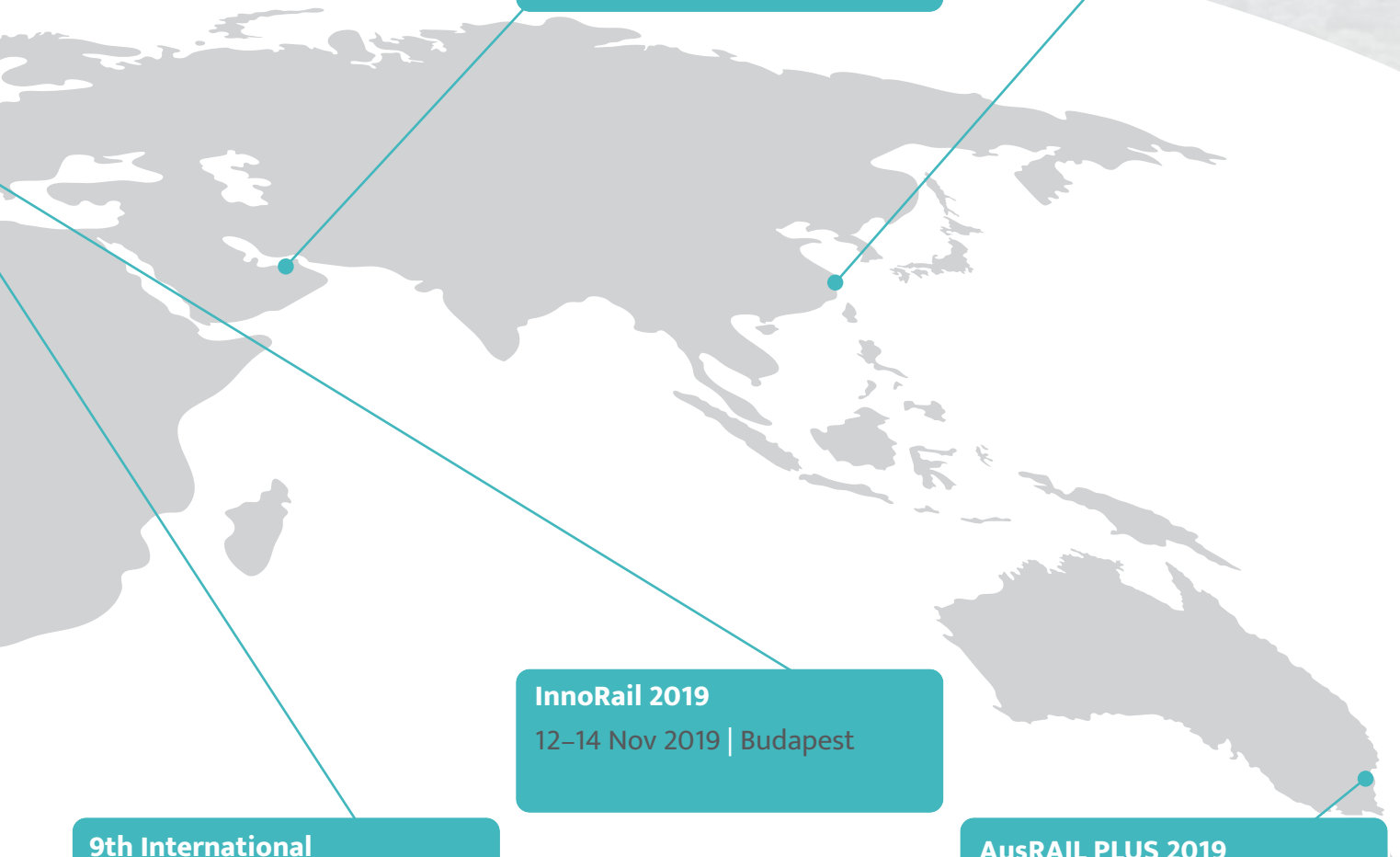
AusRAIL PLUS 2019 | Sydney
Conference & Exhibition
3-5 December

AUSTRALASIAN RAILWAY ASSOCIATION

**Fire Protection of Rolling Stock**
25–26 Feb 2020 | Berlin

**Middle East Rail 2020**
25–26 Feb 2020 | Dubai

**Modern Railways**
20–22 Nov 2019 | Shanghai



**InnoRail 2019**
12–14 Nov 2019 | Budapest

**9th International Railway Summit**
19–21 Feb 2020 | Warsaw

**AusRAIL PLUS 2019**
03–05 Dec 2019 | Sydney

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- PUR coating for easy cleaning
- Extensive colour palette

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# Elastomeric bearings for construction, industry and track

## Long-term support of structural components

For more than 45 years Calenberg Ingenieure has been dedicated to the refinement of building construction. The product range comprises special elastomer materials for special fields of application in sound and vibration insulation and reduction. Calenberg expertise reduces the risk of building damage thereby reducing maintenance costs, improves the living quality and protects against environmental effects such as traffic noise, vibration and impact sound. All activities of Calenberg Ingenieure are scientifically based and the physical measured values and data of the products are approved by official and independent institutes.

The demand for a higher standard of living quality today is not only defined in material values, but also as a sense of well being, regard for fellow man and maintaining traditional values. Today, homes and the work places are more affected by noise pollution than ever before. As a worldwide recognized authority in the field of vibration technology and noise reduction/protection Calenberg Ingenieure offer standard and 'tailor made' solutions for the improvement of living quality.

Constant research and development, over 45 years of experience and certified quality management is the reason for choosing Calenberg Ingenieure for successful projects at home and abroad.

The application of Calenberg products in the field of static load bearing is especially effective where rigid building parts are put in contact with each other and the materials are exposed to high compression stress. To protect buildings against damage, elastomeric bearings are installed in between such parts.

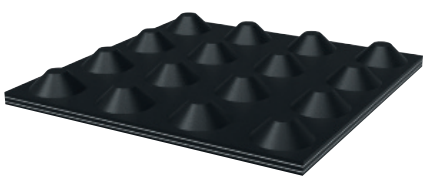
Calenberg Ingenieure radically improved the typical characteristics of elastomers by developing special bearing designs and profiling to the bearing surfaces.
Dynamic bearings from the product range of Calenberg Ingenieure should always be used where vibration and sounds are affecting the building. This vibration and structure-borne noise pollution is caused by traffic, machines, human activity and plant installation in buildings. It can lead to stress and related complaints to health of the occupants. Specially designed high-performance bearings of Calenberg Ingenieure provide effective relief.

Vibrations are perceptible oscillations that are not only disturbing to human beings but may also lead to disturbance and damage to apparatus and other installations in buildings. Structure-borne sound can radiate in a building as secondary airborne sound and can considerably influence the well being of human beings.

## Product range for track

USM® 1000 W

USM® 2000 + 3000



USM® 4000

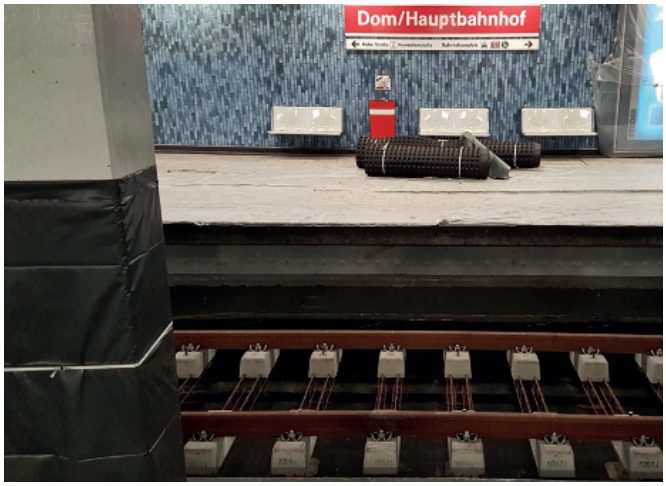
CALENBERG

Rail traffic causes airborne noise as well as vibrations or structure-borne sound. Residential and commercial locations are normally the sufferers of these emissions.
Calenberg Ingenieure use elastomeric products for their rail track program. They are produced from high grade natural and synthetic rubbers. Due to the different variants within the product range, individual solutions for nearly every vibration and noise problem can be offered.

### Why are there vibrations on the track?

Wheels are noncircular, eccentric, unbalanced and have flat areas. The rail track is not perfectly straight and even due to the construction method and due to subsoil conditions. The track which has integrated vibration control offers an effective relief. At this point an elastomeric track mat or under ballast mat can be an important part e.g. of a floating slab track or mass spring system. It also has the big advantage of increasing the durability of the track system, which reduces the maintenance costs of the track as well as of the rolling stock.

Micro cellular elastic EPDM rail pads and base plate pads are both important resilient parts of rail fastening systems. Rail pads are installed directly under the rail foot to increase the elasticity of the ballast track. This brings about a more comfortable ride and protects the permanent way, from standard gauge railway to tram way as well as in varying dimensions. The elasticity to slab track systems is brought about by high elastic micro cellular EPDM base plate pads installed between rib plate and concrete slab, reducing vibrations caused by track and wheel unevenness.




## Special product for noise protection

Increased environmental consciousness and the knowledge of adverse health effects caused by airborne noise pollution demand effective counter measures. With their lightweight and flexible Cisilent® noise barrier Calenberg Ingenieure offer a convincing solution for indoor and outdoor use where spatial and weight restrictions do not permit any other possibility. Whether as mineral wool filled curtain for use in production plants or for mobile applications such as inner-city construction sites. In both cases, a high noise reduction will be achieved.

The flexible Cisilent® noise barrier improves the well being and the fitness by noise reduction. Immediately after installation, Cisilent® offers sound protection everywhere where you need it: on busy highways, stadiums, railroad shunting yards, inner city construction sites, airports, open-air-concerts and indoors for example to protect offices from noisy production processes.

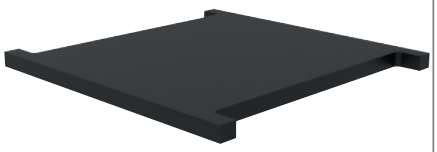
## Special product for environmental protection

The OIL-EX® Absorption Mat binds harmful substances such as oil or other hydrocarbons within its top layer. On the reverse side an impermeable sealing layer ensures that earth and ground water are not contaminated by e. g. parking rail or road vehicles with oil leakages. And because the OIL-EX® mat is mainly made of recycled material, it is eco-friendly in two ways.

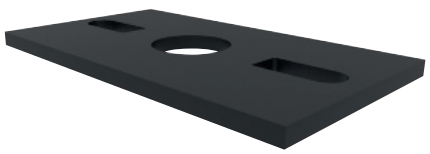
www.calenberg-ingenieure.de

USM® G 1000

RAIL PADS



RAIL BASE PADS



CALENBERG

# SECURE AND SILENT BEDDING

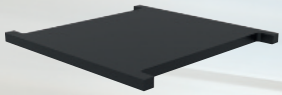
## PERMANENT WAY SYSTEMS PROTECTED BY CALENBERG

High performance rubber material
for long-life tracks.

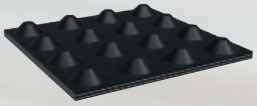
- Suitable for all modes of rail traffic
- Covering a wide range of stiffnesses
- For highly effective mass-spring-systems and low maintenance ballasted tracks
- Waterproof and resistant against weathering
- Good insulation against stray currents

**USM® 1000 W**

**RAIL PADS
BASE PLATE PADS**

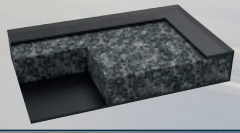


**USM® 2000-3000**



**USM® 4000**

**USM® 1000 G**



## VISIT OUR STAND

AusRail 2019 Stand no. 421

Announcement: Visit us at InnoTrans 2020

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