

RISSB HORIZONS 5.0

INTEROPERABILITY STRATEGY



EUROSTAR GROUP

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EXECUTIVE SUMMARY

Interoperability is an object that aims to improve safety of operations, increase cost effectiveness for operators and drive productivity uplifts across the rail industry. Notwithstanding the physical infrastructure variations observed across Australian Railway Networks, this report argues that a precursor to aligned asset standards is a body of enablement work that empowers the rail industry to recognise interoperability as an initiative worthy of ongoing time and financial investment.

Underpinning interoperability are the people who operate the railway and the processes they follow to do so competently and safely. Changes to people and processes are less capital intensive than infrastructure changes or construction with interoperability benefits realised in the short to medium term. Moreover, good change management empowers people and organisations, bring stakeholders within the rail industry closer to collaborate on common ground and recognise differences in a less-commercially sensitive forum.

By 2028, people and process objectives such as nationally recognised rail competency training and qualifications, and nationally recognised type approvals for rail products or systems, have the potential to quickly improve operational efficiencies for railway operators. The swift realisation of cost benefits for commercial operators is hoped to build momentum in the case for interoperability within the industry. The Three-Phase Plan demonstrates how this is done. It is hoped that this momentum will translate to strengthened support for investment future in long-term asset related changes to systems and infrastructure such as national signalling or traction electrification standards.

THE THREE-PHASE PLAN

PHASE ONE

People and
Process

Quick wins to build momentum
and encourage investment



1-5 years

KEY OBJECTIVES

- Nationally recognised Rail and Train crew and qualifications including route qualifications.
- Harmonisation of Rail Safety Legislation

PHASE TWO

Type
Approvals

Building on industry buy-in to
improve interoperability



5-10 years

KEY OBJECTIVES

- Nationally Recognised Type approval for Rail Products/ Systems
- National Safe working Rules

PHASE THREE

Signalling

Using a platform of commerciality to
improve social outcomes



Longer-term aspirations

KEY OBJECTIVES

- Traction Electrification System National Standard
- Signalling Systems National Standard
- Standard Gauge throughout the Nation

FUTURE STATE

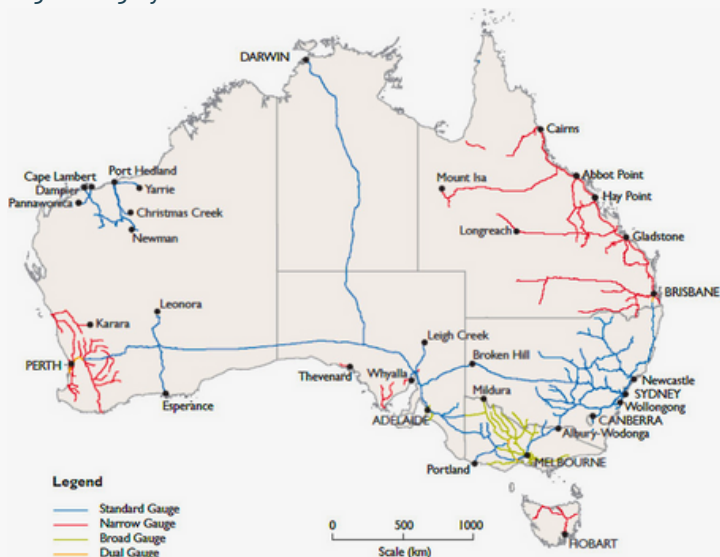
Sustainability



SUSTAINABILITY

BACKGROUND

The railway network in Australia is fragmented due to historical reasons and the country's geography. The railway system was developed during the 19th century by a number of different private companies, each building their own lines and competing for business. This resulted in a patchwork of different railway systems, with varying gauges, track widths, and signalling systems.



As a result of this fragmentation, trains cannot easily travel from one part of the country to another without changing gauges or using different systems. This has led to inefficiencies and higher costs for both freight and passenger transport. For example, goods that need to be transported across the country may need to be loaded and unloaded multiple times as they move between different railway systems, which can increase the risk of damage or loss.

In recent years, efforts have been made to standardize the railway network, with the development of the standard gauge rail system and the construction of new railway lines to link different parts of the country. However, there are still significant challenges to overcome, such as the high cost of upgrading existing infrastructure and the need to coordinate between different government agencies and private companies. Despite these challenges, the railway system remains an important part of Australia's transport infrastructure, providing a vital link between the country's major cities and ports, as well as supporting industries such as mining, agriculture, and manufacturing.

CURRENT CHALLENGES



REGULATORY

- RAIL SAFETY LEGISLATION
- WHS LEGISLATION
- SLOW REGULATORY REFORM



PEOPLE

- TRANSPORTABILITY OF RAIL WORKERS DUE TO QUALIFICATIONS
- FRAGMENTED DECISION MAKING
- RESISTANCE TO CHANGE



PROCESS

- DIFFERENCE IN RAIL VEHICLE APPROVALS
- SAFEWORKING RULES
- LACK OF COORDINATION BETWEEN RAIL OPERATORS, INFRASTRUCTURE OWNERS AND GOVERNMENT BODIES



COST

- LACK OF INVESTMENT



INFRASTRUCTURE

- RAIL GAUGE DIFFERENCES
- DIFFERENT SIGNALLING AND CONTROL SYSTEMS
- OWNERSHIP AND ACCESS
- GEOGRAPHY

Whilst standard infrastructure and systems throughout Australia would resolve current challenges faced by the industry, this would be a very long-term aspiration requiring major investment. Therefore, this report and The Three-Phase Plan we put forward is focusing on the initial achievable steps that we as an industry can take to bridge the current gaps and improve interoperability in the short to medium term. This will demonstrate to key decision-makers that longer-term targets could be achievable in the future.

PHASE ONE

PEOPLE AND PROCESS

Railways are often described in terms of physical assets: rolling stock, track, lineside infrastructure. The compatibility of physical assets is key to achieving interoperability but achieving this will take some time and significant investment from governments, suppliers, and operators. The risk is that without experiencing the benefits of interoperability, it is difficult to encourage the required capital investment, especially from commercial parties.

Luckily there is one critical railway asset that is often forgotten: people. People operate and maintain railway networks, rolling stock, and physical assets across the country, but they are, too, plagued by compatibility issues. A lack of alignment in recognition of their skills, knowledge, and experience create barriers to workforce mobility. Employers spend millions of dollars each year training new hires, equipping them with information they have already learned, but for a few minor differences. The effect on people is demoralising, the impact on productivity is devastating.

But challenges reveal opportunities. Changes to the qualifications we award our people and the processes they follow are much less costly to implement than changes infrastructure. Meanwhile, because people are one of the railways' most numerous assets, people related change is one of the most effective ways to deliver value at scale. These factors suggest a high return on investment for introducing common qualifications and procedural standards.

This report suggests that people-focused activities are a compelling starting point on the path to interoperability because they will create momentum to encourage future investment commitment towards commonality of physical assets.



Priority 1

Make general procedures operator agnostic for activities that are required across all rail networks.

Procedures including for accessing the rail corridor, protecting worksites, reporting unsafe conditions, and communicating effectively should be targeted in the first instance because these activities are required for the safe operation of rail traffic regardless of the operator.

Standardising these procedures would simplify the operation of services across network boundaries, reducing the complexity faced by train crew and maintenance staff. Reducing the complexity and volume of competing procedures is a positive outcome for safety. Meanwhile, common procedures will allow for improved flexibility when scheduling and rostering employees, resulting in improved commerciality for operators and ultimately improving the competitiveness of rail as a mode of transport.

The criticality and familiarity of these procedures for rail operators, rail infrastructure managers, and unions provides a platform for robust and constructive discussions between the parties. Regulators should provide diligent oversight and a “better off overall” style assessment to ensure that the most effective and safe procedures are selected for implementation.

Create nationally recognised railway skill qualifications that enable standardised training and assessment for the rail industry.

Priority 2

Building on Priority 1, a set of national qualifications should be developed which recognise the completion of training in relation to nationally standardised railway procedures. These qualifications would give rail industry workers a baseline level of training that is recognised across the country.

Bridging courses could be considered initially following implementation to facilitate people change management.

Standardised qualifications would improve the ability to oversee compliance from a regulatory point of view, improving safety outcomes.

Moreover, a set of nationally recognised qualifications would reduce the cost of employee onboarding and delivery of training programs. It will crucially improve labour mobility across the industry leading to significantly improved outcomes for rail workers as well as uplifting operational efficiency for operators.

Governments have an important role in promoting and incentivising collaboration. The regulator (Australian Skills Quality Authority) will coordinate the needs of the industry and operators to develop and accredit training courses that are fit for purpose. It will oversee the registered training organisations, including rail operators, to ensure courses and qualifications keep pace with industry developments.



PHASE TWO

TYPE APPROVALS

Australian railway authorities utilise a product and system review process called type approvals. These approvals are undertaken prior to the implementation of a product or system in a rail authority's corridor, evaluating their performance and safety is satisfactory for the railway environment.

Currently, every railway authority in Australia has their own type approval processes to review and approve products to be used on their networks. 29 networks exist throughout Australia (National Transport Commission, 2023), meaning any single product will need to be reviewed 29 times independently before it is approved for use nationwide. In some cases, this is additionally true for products that fully conform to current Australian Standards for railway applications.

The Problems

Products and systems being developed today for the improved operation and safety of Australia's railways face a barrier to nationwide entry due to the number of type approval required for use. Each approval involves a full review of the performance and safety of the product. This takes time and effort from both the railway authorities' staff as well as suppliers, resulting in slow progression towards safer and more reliable products and thus networks in Australia. These current processes are additionally stifling potential competition and innovation the railway industry could be benefitting from today.

Furthermore, a recent study into the costs associated with multiple type approval processes nationally estimated a potential 250 million Australian dollars is being unnecessarily spent on approvals, both single and duplicates (RISSB, 2022). This directly correlates to RISSB's second and third phase objectives in the National Rail Action Plan in achieving common standards as well as common operating rules, communication systems, and control systems. Type approvals for these products and systems would and are necessary, and an efficient process to implement them nationwide would likely produce beneficial outcomes.



The Solution

A nationwide type approval framework would allow the inefficiencies of today's processes to be minimised, with a single approval process saving authorities time and allowing performance and safety enhancing products be put into track sooner. Such a framework does already exist under AS7702 – 2014, but is not required to be followed by any authority today and would incur unwanted costs to implement. Currently, Australian rail authority standards teams across the country are having discussions around merging their approval processes, however differences in each other's requirements as well as state level railway standards are proving this merge to be more difficult than anticipated.

Majority of authorities approval documents and requirements overlap. Some aspects would need to be deliberated on amongst the authorities' relevant divisions. Ideally, RISSB would coordinate the development of this process, and possibly employing existing type approval teams to conduct this work for authorities. This initiative would likely need to be jointly funded by the rail authorities and government.

Suppliers would likely see this as an opportunity to invest more so into the Australian rail market, as they would not have the barrier to entry they previously had. Innovation would be driven further as the economic viability of doing so would be achievable, as well as attract suppliers from overseas who may have competitive products, but not the resources to have them approved in Australia. With more suppliers working with Australian rail authorities, price competitive products would likely become available. Bulk ordering from multiple authorities could see economies of scale significantly reduce the expenditure on railway components, allowing railway's and taxpayer's dollars to be invested more efficiently.



PHASE THREE

SIGNALLING

Australia's railway signalling has had a very unique development over the past one and a half centuries. Each state has developed their own signalling principles and standards borrowed from either the British or European railways (The Science of Rail Signalling, n.d.).

Unfortunately, the development of each state has been largely independent of the others resulting in fragmented and incompatible signalling systems.

The issues drill down into the fundamental nature of how the railways operate known as speed or route signalling (from conventional signalling standards). While many of these issues are deep from both a historical and fundamental aspects, there are still many facets that may be addressed in the short to medium term that will promote interoperability of the railways.

The Problems

The current climate of Australian railways poses various signalling integration challenges.

From a cursory glance, it might be appealing to attempt to consolidate signalling principles first (such as integrating speed and route signalling). However, this is a very tedious and labourous task. Updates to signalling fundamentals such as these will require full redesigns of all signalling plans and recommissioning of each railway. This is an impractical goal for the short to medium term.

More immediate issues that face signalling systems are of technologies being incompatible with one another. For example, within one railway operator let's take MTM (Metro Train Melbourne) there are various interlocking equipment (interlocking is essentially a computer that is the brains of the railway. It is responsible to ensure safe movement of trains and sends command to signalling assets on the field). However, these interlocking systems are generally incompatible with one another. This makes the integration of various signalling systems quite challenging leading to either complex interfaces or the need to upgrade the entire system.

Addressing the issues



For the purposes of keeping this discussion both brief and pertinent, only conventional signalling has been addressed. Non-conventional signalling or moving block signalling systems such as a Computer Based Train Control (CBTC) or European Train Control System (ETCS) is excluded. Our justification for this is that the majority of Australia adheres to conventional signalling. Therefore, we believe that this must be addressed first to consolidate the railways.

Historically, attempting to consolidate signalling technologies by utilising a single vendor has led to issues of vendor locking. This meant the technologies would become highly monopolised. Competition and innovation diminished while the cost of upgrades increased. Therefore, it is far more prudent to be introducing nationalised regulation and standards on the use of signalling systems, technologies and their compatibility with one another. This is important to ensure that vendor locking is far more unlikely, it allows rail operators to inform their requirements more clearly and it also promotes cross pollination of rail workers.

Standards which promote this type of interoperability already exist in European standards. EN50128 and EN50129 both address the hardware and software of signalling equipment and technologies. Standardising the type approval process along the lines of these documents would mean operators could readily accept generic equipment certified in one jurisdiction to a given Safety Integrity Level (SIL) would be equivalent in another jurisdiction. The individual applications may still vary in terms of specific application with respect to signalling principles but it would ensure that equipment compatibility will be present.

Fortunately, many suppliers already look to comply to EN50128 and EN50129 standards so a lack of equipment will not be a significant challenge. The main challenge will be for the operators to update their type approval process and standards to ensure compliance to these documents while retaining existing signalling equipment which will become non-compliant going forward. Interface challenges will continue to exist in brownfield areas however with upgrades and re-signalling projects they will be replaced with the more compatible systems in the longer term.

FUTURE STATE

SUSTAINABILITY and Socio-Economic Factors



The Australian rail industry in its current state plays an important role in providing a sustainable form of passenger and freight transportation and achieving the nation's net zero targets. Rail is a more environmentally sustainable than other modes of transport. Metro train systems emit 3-21 Average emissions per kilometre (gCO₂ /km) per person as opposed to the average car sold in 2015 which emits 184 (gCO₂ /km) per person (Climate Council, 2017). Rail is able to achieve generate '16 times less carbon pollution than road' (ARA 2021) and provide a viable option over other modes such as air freight and travel. However, to continue to display its advantages over other modes of transport, the rail industry needs to continue to seek areas for improvement and compete as a nationwide network with increased interoperability.

It also holds responsibility in the spend of federal and state taxpayer dollars, whether it be in the initial design and build of infrastructure, or in the contracts that governments hold across Australia with operators and maintainers. Governments must ensure this spend is made in an environmentally responsible way to contribute to the public's zero carbon expectations, and ensure this taxpayer spend is socially responsible in terms of opportunity cost as compared to other areas which also provide a social contribution to the community. By improving interoperability in certain areas as identified in this report, costs can be saved, efficiency improved, and sustainability embedded into decision-making, by all involved to ensure responsible spending.

Nationally Recognised Type approval for Rail Products/Systems would create opportunities for innovation and improve economies of scale to improve efficiency. A consolidated framework for the consideration of environmental and socially responsible aspects of products can ensure sustainability is considered consistently across the country and provides an opportunity for product developers to strive to improve in this area. This same environmental framework can be evolved going forward into future phases to provide consistent assessments on infrastructure upgrades to ensure sustainable outcomes are considered by all.

In addition to the many jobs created within construction industry for infrastructure projects, the rail industry supports '165,000 direct and indirect jobs' (ARA 2021). It's important the rail industry continues to attract a skilled workforce to operate Australia's rail networks and safely allow 3.5 million passenger journeys across Australia each weekday and \$4.7 billion per year of freight to safely and efficiently reach their destination (ARA and Deloitte, 2020). By improving processes for people within the industry through Nationally Recognised Training and Qualifications, this can provide many more opportunities for geographical movement of skilled workers across various rail networks and remain an attractive industry to work. By allowing more opportunity and growth, this opens up the industry for skilled workers to see a long-term future in rail, attract young talent, and improve competitiveness and productivity. The social outcomes this may bring to people all over Australia through the use of a consistent framework for upskilling can provide a great return on investment, as per previous relevant examples such as the Barangaroo Skills Exchange which demonstrated '\$11.76 in net economic and social value generated for every \$1.00 invested in the program' (Lendlease, 2017).

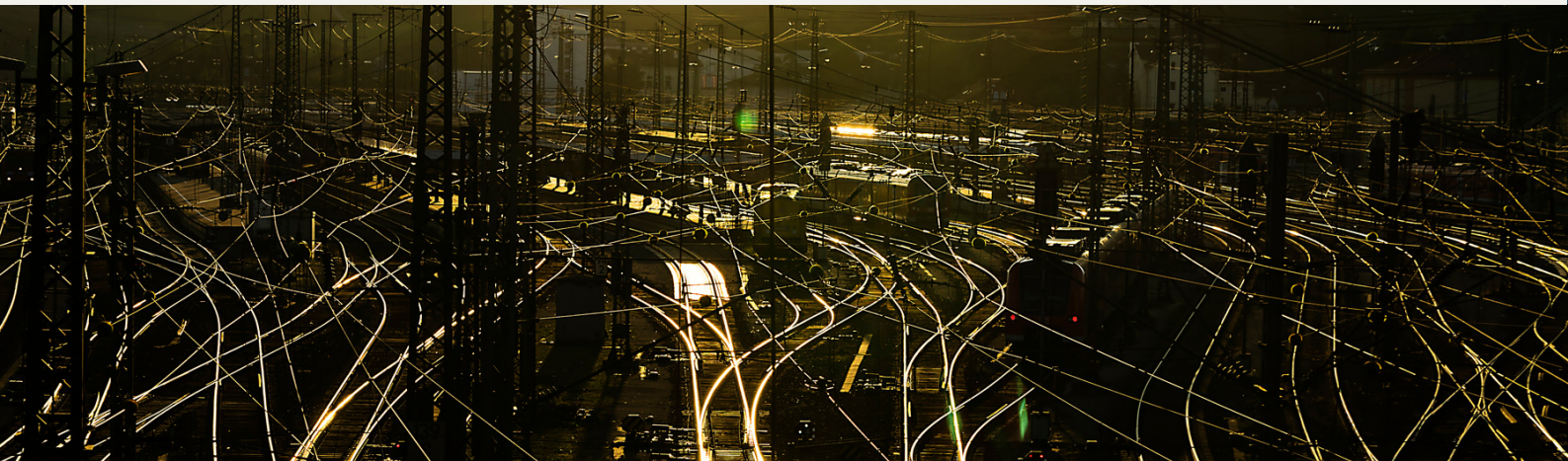
It's evident that rail provides an opportune area to continue to meet federal policy and community expectations when it comes to reduced emissions, if it continues to remain competitive. The rail industry holds a unique position in the level of government involvement in numerous areas of the industry, and is able to incorporate sustainability within decision-making mechanisms. The areas identified to improve interoperability in this report demonstrate where the rail industry may focus to increase its competitiveness with other modes of transport in passenger and freight sectors, to achieve improved environmental and social outcomes for the nation.

CONCLUSION

This report sought to consider interoperability in the Australian rail context and prioritise activities needed to achieve improved interoperability. The report identified five key challenges currently facing the Australian rail industry and provided staged solutions to implement and deliver an interoperable future in the Australian rail industry.

By initially focusing on people and processes, consistency can be developed to allow for existing operations and the current influx on new rail projects that are occurring throughout the country. Whilst people and processes are improved, the type approval process can be streamlined to allow for consistent approvals and opportunity for investment by suppliers, creating growth in the industry. The last solution tackles the historical issues of different Australian signalling systems by introducing a nationally consistent regulations and standard to ensure compatibility. Lastly, the sustainability solution is aimed to provide a framework to ensure consistency across the country.

By adopting the identified solutions and implementing across the proposed time period through The Three-Phase Plan, governments, suppliers, operators, regulators, unions and industry body stakeholders can collaboratively work together to achieve an effective and safe outcome for the wider industry. The benefits achieved through the proposed solutions can contribute towards an increase in industry size, profitability, sustainability and contributions to the communities in which the industry serves.



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Images:

Pg. 1 Gyn9038. Black and white photo of some old rails. Getty Images.

Pg.3 Australia's long-distance rail network www.researchgate.net.

Pg. 4 images owned by Authors.

Pg. 6 Shauni. Aerial view of rail yard. Getty Images

Pg. 7 Tookapic. Gray scale photography. Getty Images.

Pg. 8 Haveblue. Rail Traffic Signal 3008. Getty Images.

Pg. NSW Single light signal with band of lights & Shunt aspects. Wikipedia/Australian-Railway-Signalling.

Pg. 11 TomekD76. Rails. Getty Images.

Pg. 12 images owned by Authors.

AUTHORS

and Interoperability Reflections



Amelia Barnes

To me, Interoperability means providing a consistent decision-making framework that reflects the values of all Australians working in, and utilising, rail services.



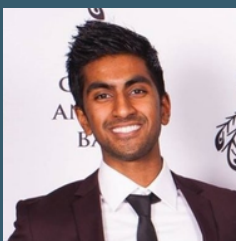
Michael McGhie

To me, Interoperability is about ensuring a consistent and safe approach for systems to connect in a coordinated way to achieve the required outcomes.



Ken Liu

To me, Interoperability means collaboration and alignment in planning to improve efficiency across Australia's railway networks.



Suresh Sangarapillai

To me, Interoperability means we integration of all railways for seamless operations across boundaries.



Tomos Luker

To me, Interoperability in rail means the enablement of efficient operations between authorities and states.



Karen Sheiles

To me, Interoperability means streamlining Australia's rail networks to create harmony, and make rail the most successful and sustainable mode of transport.



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