

Public Submission to the National Transport Commission

Discussion Paper: Options to harmonise rolling stock testing and test locations

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Contents

Contents	2
Executive Summary	3
Introduction and Scope	4
Our approach	4
Scope of this submission	4
A note on the author's position	5
Response to Question 2 – Where harmonisation would be most effective	6
Response to Question 4 – Learning from international ETCS integration testing.....	7
Response to Question 5 – The need for a national ETCS test capability, and its value	8
Response to Question 6 – How the options fit together.....	9
Response to Question 7 – Quick wins and the closing window	10
Response to Question 9 – Simulation and validation protocols	12
The next step, and why it is urgent.....	13
Glossary of Abbreviations	14
References	15
About this submission	15

Executive Summary

This submission responds to the National Transport Commission (NTC) Discussion Paper, Options to harmonise rolling stock testing and test locations, June 2026. It does not address the harmonisation of the existing rolling stock testing regime for freight wagons and locomotives. Other parties are better placed to comment on that legacy work. The submission addresses one dimension that the Discussion Paper opens up but does not yet develop: the compliance and interoperability testing that the national transition to the European Train Control System (ETCS) is about to add to rolling stock approval.

As ETCS is fitted across the locomotive fleet, every fitted locomotive must be shown to operate safely and consistently against the ETCS trackside application of each network it runs on. That is a new testing burden, and it falls on exactly the category the Discussion Paper rates hardest to harmonise, the electrical and signalling interaction between vehicle and network (page 21). Met the way much of the current testing landscape has grown, network by network and project by project, it will deepen the fragmentation, duplication and cost the Discussion Paper sets out to reduce.

There is a way to meet it that does the opposite. An independent national ETCS test and integration capability holds a verified test bench, a 'Golden Reference', for each jurisdiction's ETCS trackside application. Onboard equipment is tested against those Golden References in one place, by automation, away from the track. Field possessions and network shutdowns are not required or at least substantially minimised, and several jurisdictions can be covered in a single campaign by switching between Golden References. The same capability that removes duplication from rolling stock testing also removes cost and delay from the national ETCS rollout. The two objectives are one.

This is not a theoretical proposition. The United Kingdom built such a capability, the National ETCS Test Lab, an independent facility where products from different suppliers are tested against the standard and the national reference, and it was operational within a year of the contract to build it. It sits alongside, not instead of, a separate dynamic rolling stock test track, and that distinction is instructive for Australia.

The case for acting now is timing. ETCS fitment of the interstate locomotive fleet is at its beginning, the ETCS programmes for the interstate network and for Melbourne are forming, Sydney and Brisbane are progressing their rollout programmes. A common reference approach captured at the start of these programmes is worth a multiple of one retrofitted later. The Discussion Paper's own next steps list a feasibility study for a national testing facility (page 27). For the ETCS dimension, that study is the logical and urgent next step, and this submission offers to contribute the conceptual work already developed toward it.

This submission responds to Questions 2, 4, 5, 6, 7 and 9.

Introduction and Scope

This submission responds to the National Transport Commission (NTC) Discussion Paper, Options to harmonise rolling stock testing and test locations, June 2026. Throughout, a bare page reference refers to that Discussion Paper, and any other source is named with its own locator.

This submission does not address the harmonisation of existing rolling stock testing requirements. Other parties, the Rail Infrastructure Managers (RIMs) and Rolling Stock Operators (RSOs) who work inside the legacy regime, are better placed to comment on the testing of freight wagons and locomotives as it stands today.

The contribution made here concerns what is arriving on top of that regime. The national transition to the European Train Control System (ETCS) introduces an onboard signalling compliance and interoperability dimension to rolling stock approval that is largely absent from the freight fleet today. If this new dimension is addressed network by network and project by project, as much of the current testing landscape has grown, it will compound the fragmentation, duplication and cost that the Discussion Paper documents. The submission therefore addresses the ETCS dimension early, while it is still inexpensive to shape. Done well, the same measures that reduce duplication in rolling stock testing also reduce the cost and delay of the national ETCS rollout. The two objectives are not in tension. They are the same problem caught at the right moment.

Our approach

The Discussion Paper returns to four difficulties throughout. Duplicated effort when the same vehicle is tested again for each network. Test results that are not recognised across networks. The cost and logistics of field testing, including the possessions and access it requires. And a chilling effect on innovation, where operators keep older approved vehicles rather than face the delay of introducing new ones (section 2.2.4). The responses below return to those four difficulties, and rest on a single mechanism. An independent national capability that holds a verified Golden Reference for each jurisdiction's ETCS application, tests against it by automation, takes that testing offline, and consolidates several jurisdictions in one place. It does not flatten the differences between networks, which are real and largely legitimate. It consolidates the testing of them.

Scope of this submission

This submission responds to the questions where ETCS compliance and interoperability testing bears directly on the matter raised, namely Questions 2, 4, 5, 6, 7 and 9. It does not respond to Questions 1, 3, 8, 10 and 11. Questions 1 and 3 concern the legacy rolling stock approval regime and its prioritisation, which the RIMs and RSOs who operate it are better placed to address. Questions 8 and 11 concern physical flexibility in test locations and a register of test sites for rolling stock dynamics, which sit with dynamic track testing rather than with the signalling interface, and the one point relevant here, the recognition of simulation, is made under Question 9. Question 10 concerns how the NTC should structure its own programme, on which this submission offers no view.

A note on the author's position

The author has developed conceptual work on an independent national ETCS test and integration capability of the kind discussed here and would welcome contributing it to any feasibility work the NTC takes forward. The question of who should host, govern, own or operate such a capability is left open in this submission, as a matter for that feasibility work to determine.

Where the Discussion Paper invites evidence (page 3), the sources drawn on are named in the relevant response and listed in full at the end of this submission.

Response to Question 2 – Where harmonisation would be most effective

The most effective harmonisation in the ETCS dimension comes from separating two things the question can blur: harmonising the requirement and harmonising the test.

The signalling interface itself should not, and largely cannot, be harmonised away. The Discussion Paper rates electrical and signalling interaction the hardest category, highly network specific (page 21), and that judgement is correct. The ETCS trackside application of each network encodes that network's own signalling principles and operational rules. ETCS sits on top of the local signalling. It does not erase it. Two jurisdictions can both conform fully to the ETCS standard and still present genuinely different applications. Convergence on ETCS does not make those applications the same.

Therefore, harmonising the requirement is the wrong target. What harmonises cleanly is the testing of the requirement. The Discussion Paper's own assessment found that the tests required across networks are common in intent and scope, and that the divergence lies in how they are applied. For the signalling interface the equivalent holds: the thing being verified differs by network, but the method of verifying it remains the same. A common test method, common reference scenarios, automated execution and mutual recognition of the result can be shared across networks even while each network keeps its own application.

That is where harmonisation is most effective for the ETCS dimension, at the test layer rather than the requirement layer. It is also where it is most achievable, because it asks no infrastructure manager to change its signalling, only to accept a common and independent way of proving conformance and compatibility. The path forward is to treat the onboard-to-trackside ETCS interface as a priority candidate for harmonised testing, distinct from harmonised standards, and to resource the test method and reference work accordingly.

Response to Question 4 – Learning from international ETCS integration testing

The Discussion Paper's international review is thorough on rolling stock test tracks, citing the Transportation Technology Center, Velim, Rail Tec Arsenal and Old Dalby. It is built around dynamic vehicle testing. For the ETCS dimension there is a different and highly relevant international model the review does not cover: lab-based ETCS integration testing against a reference, conducted offline.

The clearest example is the United Kingdom's National ETCS Test Lab. It is an independent facility where ETCS products from different suppliers are tested for compliance with the standard and with the national reference design, giving the infrastructure manager, the regulator and the suppliers a repeatable reference point (AtkinsRéalis, National ETCS Test Lab; Rail Engineer, February 2023). Its independence is the point. It provides a trusted, neutral diagnosis when several suppliers' equipment must work together. This is the Golden Reference model in service.

The United Kingdom runs this lab alongside, not instead of, a dynamic rolling stock test track, the Rail Innovation and Development Centre. The two are complementary. The track tests vehicle dynamics, the lab tests signalling integration, and the lab can control the on track ETCS test remotely (Network Rail media centre, 2021). For Australia this is the instructive distinction. A national rolling stock dynamic test capability and a national ETCS integration capability are different facilities answering different needs, and a mature ETCS nation builds both. A national testing conversation that stops at the test track will miss the half of the problem that the ETCS transition makes most acute.

Two further learnings sit in the Discussion Paper's own sources. The European framework, through EN 14363 and the Technical Specifications for Interoperability, increasingly accepts validated simulation in place of physical testing, which the Paper notes (sections 3.1 and 3.4). And the United States Association of American Railroads categorisation, Category A to D (section 3.3), scales the required testing to how far a new design departs from an accepted reference. Both are versions of a single principle. Test against a recognised reference, and test more only where a design departs from it. The path forward is to investigate the lab-based ETCS integration model, the United Kingdom National ETCS Test Lab in particular, as the international reference most relevant to Australia's ETCS rollout, separately from the rolling stock test track precedents the Paper already covers.

Response to Question 5 – The need for a national ETCS test capability, and its value

For the ETCS dimension the need is clear and growing. As ETCS is fitted across the locomotive fleet and rolled out on multiple networks that form part of the National Network for Interoperability (NNI), every onboard installation must be proven against each network's ETCS application. Done network by network, that is the duplication, the lack of mutual recognition, and the field-access cost the Discussion Paper is trying to remove, reproduced in a new and more complex form.

The value of a national capability is best stated in the Paper's own terms.

An independent national ETCS test and integration capability

A neutral national capability holds a verified test bench, a Golden Reference, for each jurisdiction's ETCS trackside application. Onboard equipment is tested against those references by automation, offline and away from the track, so no possessions or network shutdowns are required. Several jurisdictions are covered in one campaign by switching between Golden References.

The capability does not remove the differences between networks. It consolidates the testing of them, in one independent place whose results every Infrastructure Manager, every Rolling Stock Operator and every supplier can trust.

Against the Paper's four difficulties the value is direct. Duplication falls, because one verified Golden Reference per jurisdiction is tested once, in one place, and recognised across networks. Field-access cost falls, because testing is offline and automated, removing the possessions and logistics the Paper describes (section 4.5.3). Mutual recognition is delivered, because an independent and neutral facility produces a result all parties can accept (section 4.4.3). And several applications are covered in one campaign, rather than each network repeating the work.

Independence is the key property of such a national facility, and the Discussion Paper already reaches for it twice. It cites the Independent Competent Person concept for validating vehicles (section 4.3.4), and its own footnote contemplates a coordinating function independent of the infrastructure managers (footnote to section 4.4.3). A test and integration capability is most valuable when it is neutral, because its results are accepted precisely because no network and no supplier owns them.

Precedent confirms both the need and the feasibility. The United Kingdom's National ETCS Test Lab is independent, multi-supplier and reference-based, and it was operational within a year of the contract to build it. Reportedly, a major challenge of that facility is providing enough capacity for all testing demands. The answer to Question 5, for the ETCS and signalling interface, is that there is a clear national need, and that its value is measured directly against the duplication, recognition and field cost problems this Paper identifies. The following response on quick wins and the closing chapter on the feasibility study set out how to capture it.

Response to Question 6 – How the options fit together

The Discussion Paper asks whether its options are best taken alone, in combination, or all together, and which to prioritise. For the ETCS dimension the answer turns on two things, how the testing capability is shared and how its results are recognised. The two are not alternatives. They are parts of a single arrangement, and they are strongest together.

On sharing, ETCS integration testing and rolling stock dynamic testing are distinct capabilities that answer distinct needs. One verifies the signalling interface between onboard and trackside. The other verifies vehicle dynamics. The United Kingdom runs the two at separate sites and keeps them linked, the National ETCS Test Lab for integration and the Rail Innovation and Development Centre for dynamics. Australia could follow the same separation or co-locate the two where co-location gives a logistical advantage in the specific Australian case. That choice is a logistical and governance matter, and it follows the question of who owns and operates each capability rather than leading it. This submission therefore does not prescribe the siting. It leaves it open, to be settled alongside the ownership arrangements in the feasibility work.

On recognition, the value of a shared facility only materialises if its results are accepted across networks. The Discussion Paper makes that conditional, recognising results from a shared location provided the conditions and methodologies meet agreed standards (section 4.3.4), but it leaves the agreed standard undefined. It need not be invented. The agreed standard already exists. It is ISO/IEC 17025, the international standard for the competence and impartiality of testing and calibration laboratories, and in Australia it is administered through accreditation by the National Association of Testing Authorities (NATA), the sole national accreditation body, whose results are recognised here and, through the International Laboratory Accreditation Cooperation arrangement, across more than 100 economies abroad. Accreditation of the test facility to ISO/IEC 17025 is the concrete answer to the open provision in section 4.3.4, and it pairs with the Independent Competent Person the same paragraph already names, the person being competent under the one and the facility being competent and impartial under the other.

The two ideas resolve together, and that settles the question of priority. Recognition rides on accreditation to the agreed standard, not on where the facility sits or who owns it. So the sharing question and the siting and ownership questions can be decided on practical and governance grounds, because the recognition of the results does not depend on any of them. It depends on the accreditation. Develop the shared capability and its accreditation together, and the siting and ownership can then be settled on their own merits without putting recognition at risk.

Response to Question 7 – Quick wins and the closing window

There are two quick wins for the ETCS dimension. One is a matter of method. The other, and the more important, is a matter of timing.

On method, the Discussion Paper concedes that testing can be aligned even where standards differ, and that infrastructure managers could agree common test formats and simulation protocols ahead of full standards harmonisation (section 2.2.5), while warning that the standards-led route is slow. The quick win follows directly. Stand up reference-based, automated, offline testing of the onboard-to-trackside interface as a near-term efficiency, framed as harmonised test methodology and documentation, a common validation protocol and reporting template referenced to the relevant standard (section 4.3.3), rather than reopening each network's acceptance criteria. This delivers mutual recognition of test results without waiting for the standards work behind it. It will also provide the Australian organisation tasked with ETCS approvals, ONRSR, with a standardised approvals basis which is coherent between jurisdictions.

On timing, the real quick win is the window itself. The value of a shared reference capability depends heavily on when it arrives. A programme that adopts a common reference approach from the start avoids the duplication this Paper targets. A programme that has already solved the problem privately can only be retrofitted, which is the cost the Paper is trying to remove. Several major ETCS programmes are at exactly the moment where that choice is still open:

- The ETCS fitment of the interstate locomotive fleet is at its beginning. This is the closest of all to the subject of this Paper, because it is rolling stock. A locomotive fitted for interstate operation must be proven interoperable against each jurisdiction's ETCS application, which is a rolling stock approval problem and a signalling interoperability problem at once.
- The interstate network ETCS programme and the Melbourne ETCS programme are forming up and have not yet locked their testing approach.
- Sydney's Digital Systems Program is completing its early deployment schemes of Tranche 1 and expanding its rollout of ETCS Level 2 in Tranche 2. Sydney deliberately developed two ETCS trackside suppliers whose solutions must interoperate, which is precisely the multi-supplier scenario a shared reference capability exists to prove (Transport for NSW, Digital Systems Program; S Lemon, Digital Systems technical paper, RTSA). The proposed national ETCS test facility would capture that initiative before any testing divergence within a single jurisdiction becomes entrenched.
- Brisbane's ETCS Level 2 rollout is currently focused on a proof of concept on the Shorncliffe Line and the subsequent first major installation on Cross River Rail. Further rollout is expected prior to the 2032 Olympic Games, starting with The Wave project which introduces a second ETCS trackside supplier to the Brisbane network. As for Sydney, the proposed national ETCS test facility would come in time to establish coherent testing protocols inside this jurisdiction, also capturing interoperability testing between Brisbane and Sydney at the ideal point in time.

Captured now, a common reference approach can shape four or five programmes from the outset or at an early enough stage. Left until later, each will establish its own divergent process, maybe even multiple ones per jurisdiction, which is precisely the duplication the Paper exists to remove.

Speed is on the side of acting. The most comparable reference facility internationally, the United Kingdom's National ETCS Test Lab, moved from contract to operation in under a year (Railway Gazette International, August 2021; Rail Engineer, February 2023). A capability of this kind is deliverable on a timeframe of months rather than the years typical of ETCS infrastructure delivery, which is why the window matters and why the feasibility work is urgent rather than routine. The path forward is to treat reference-based offline testing of the ETCS interface as a near-term, methodology-level quick win, and to treat the timing relative to the current and emerging programmes as the decisive factor in capturing it.

Response to Question 9 – Simulation and validation protocols

For the ETCS and signalling interface, simulation is not only viable, but also the appropriate primary method, because what is being verified is the logical message exchange and system behaviour between onboard and trackside, not physical vehicle dynamics. The digital twin is the executable form of the Golden Reference described above, a validated model of a jurisdiction's ETCS application against which onboard equipment is run through the full set of operational test scenarios, offline.

This is how the lab-based model already works internationally. The United Kingdom's National ETCS Test Lab runs tested equipment through operational test scenarios on a simulated railway environment built on a real-physics model (AtkinsRéalis, National ETCS Test Lab). Validated simulation is already accepted in the European framework through EN 14363 (section 3.1), and New Zealand goes further and requires dynamic simulation before a vehicle may operate (section 3.5). The precedent for demonstrating compliance by validated simulation is established.

On the protocols the question asks for, four are essential:

1. Validation of the Golden Reference model against the authoritative jurisdiction specification and against field observed behaviour, so the model is a faithful executable reference.
2. Configuration management and versioning of each Golden Reference across ETCS baselines, so it is always clear which version a result was produced against.
3. Regression testing across baseline versions, so a change in the standard or the application can be re-verified without a full field campaign.
4. Independent governance of the Golden References, so every network and supplier trusts a result none of them produced.

A boundary is worth stating. This applies to the signalling and ETCS interface. It is not a claim that simulation replaces dynamic ride, brake or other physical rolling stock testing, which remains a matter for physical trials and the dynamic test capability that supports them. For the onboard-to-trackside ETCS interface specifically, reference-based simulation is the right primary method. The path forward is to adopt validated simulation as the primary compliance method for the ETCS interface, governed by the four protocols above, and to recognise its results nationally on that basis. The Paper's next steps already contemplate protocols for accepting simulation testing (page 27), and the ETCS interface is where they would deliver the most.

The next step, and why it is urgent

The Discussion Paper's next steps include feasibility studies for a national testing facility (page 27). For the ETCS and signalling dimension, this submission supports that step without qualification and adds that it cannot wait.

The reason is the window set out under Question 7. Of all the elements the Paper lists for further work, a national ETCS test and integration capability is the one with a closing opportunity, because the programmes that could adopt a common reference approach from the outset, the interstate fleet fitment above all, are committing their approaches now. A feasibility study begun once those decisions are made is a study of how to retrofit. A feasibility study begun now is a study of how to capture.

The study would need to settle the questions this submission has deliberately left open: the scope of the capability, its governance, its funding, and the arrangements for its independent ownership and operation. These are exactly the questions on which an independent and neutral answer matters most, because the capability's value rests on results that no network and no supplier owns. The author has developed conceptual work toward such a capability and would welcome contributing it to the feasibility study, to inform the scoping, governance, funding and independence questions, while leaving the determination of those questions to the study itself.

The transition to ETCS is the largest change to Australian rolling stock approval in a generation. The testing burden it brings can be met in a way that deepens the fragmentation this Paper documents, or in a way that reduces it. The difference is whether the national capability is shaped now, while the programmes that need it are still being shaped, or assembled later, after the cost has already been paid network by network.

Glossary of Abbreviations

Abbreviation	Term
AAR	Association of American Railroads
EN	European Norm
ETCS	European Train Control System
ICP	Independent Competent Person
NATA	National Association of Testing Authorities
NNI	National Network for Interoperability
NSW	New South Wales
NTC	National Transport Commission
ONRSR	Office of the National Rail Safety Regulator
RIM	Rail Infrastructure Manager
RSO	Rolling Stock Operator
RTSA	Railway Technical Society of Australasia
TSI	Technical Specification for Interoperability

References

- National Transport Commission, Options to harmonise rolling stock testing and test locations, Discussion Paper, June 2026 (the document responded to throughout).
- AtkinsRéalis, National ETCS Test Lab (NET-Lab), atkinsrealis.com (cited in Responses 4, 5 and 9).
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- Transport for NSW, Digital Systems Program (Sydney), introducing ETCS Level 2 and a new Traffic Management System, transport.nsw.gov.au (cited in Response 7).
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- Infrastructure Australia, High Capacity Signalling, Sydney (Digital Systems Program), on the mandatory ETCS pathway for the National Network for Interoperability, infrastructureaustralia.gov.au (cited in the Executive Summary and Response 7).
- EN 14363, Railway applications, testing and simulation for the acceptance of running characteristics of railway vehicles, as referenced in the Discussion Paper sections 3.1 and 3.4 (cited in Responses 4 and 9).
- Association of American Railroads, categorisation of new vehicles (Category A to D), as referenced in the Discussion Paper section 3.3 (cited in Response 4).

About this submission

This submission was prepared by Dr Frank Heibel of Doc Frank Rail Services, an independent specialist consultancy in railway signalling with no supplier affiliation. The views expressed are the author's own, offered as a public submission to the National Transport Commission. The submission addresses a defined part of the Discussion Paper, the ETCS compliance and interoperability dimension of rolling stock testing and does not purport to cover the rolling stock testing regime as a whole.

End of Submission