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RAILWAY INDUSTRY ASSOCIATION
Championing a dynamic rail supply sector

Growing rail freight: The need for targeted electrification

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There are many good reasons to grow rail freight – it takes pressure off the roads, boosts economic growth, ensures resilient supply chains across sectors such as food and construction, and supports energy security and decarbonisation. There now needs to be a focused plan to achieve the Government target of 75% rail freight growth by 2050.

To achieve the target, there will need to be a strategic rail freight network that is electrified. This does not mean electrifying the entire UK railway; a previous RIA reportⁱ found that electrifying a further third of the network for passenger traffic would also electrify 95% of freight traffic. On these critical routes, freight trains need electric traction power to be able to carry bigger loads and reach the average speeds that avoid them getting in the way of passenger services. While electrification involves upfront investment, it will reduce the whole-life cost of the railway.

As the Government brings forward plans for rail investment, the Railway Industry Association, in conjunction with the Rail Freight Group and the Railway Engineering Institution (RailEI), with research undertaken by the University of Birmingham, has identified a number of practical proposals to maximise the potential for electric freight haulage. The research established that battery only locomotives are not a substitute for electrification but hybrid (electric and battery) locomotives have a role in specific situations.



Electric railways deliver better performance and lower costs for passengers, freight, and taxpayers

Rail electrification is proven technology for high-volume passenger and freight transport. It improves performance, lowers whole-life costs, and offers strong long-term value. This is why many countries around the world have electrified their railways.

Rail freight is a strategic economic asset for the UK

Rail freight is a major but often under-recognised contributor to the UK economy. It moves a quarter of all containerised goods from the nation's ports, delivers £2.45 billion in economic benefits, and removes 1.6 billion lorry kilometres from the road networkⁱⁱ.

A single freight train can carry the equivalent of 76 HGVs on average and emits 76% less CO₂ per tonne than road freight (diesel locomotive compared to diesel lorry, electric trains are even cleaner with zero lineside CO₂ emissions). Around 90% of rail freight's economic benefits are felt outside London and the Southeast, supporting communities and industries across the UK.

Rail freight supports national priorities including housing, infrastructure, economic transformation, resilience, and energy security. With government aiming to grow rail freight by 75%, maximising electric freight will be essential.

Rail investment benefits both passengers and freight

Freight and passenger services share the same network, so investment for one often benefits the other. Electrification, modern signalling, and targeted infrastructure upgrades can improve speed, reliability, and capacity across the railway.

That is why freight should be fully considered in the Department for Transport Operator's Rolling Stock and Infrastructure Strategy. Electrification can create more capacity and more train paths for both freight and passengers, offering a major opportunity for Great British Railways.

Immediate opportunities to maximise rail freight, support growth, and benefit passengers

Increasing the share of electrically hauled freight trains, using both existing electric locomotives and new bi-mode (electric and diesel) fleets, would deliver immediate operational and economic benefits.

More capacity for freight and passengers

On mixed-traffic routes, capacity is often limited by infrastructure and differences in train speed. On the West Coast Main Line, where around 90% of intermodal freight runs, diesel freight trains climb steep gradients much more slowly than passenger services. This reduces available capacity.

Electric freight locomotives, including bi-modes operating electrically under the wires, offer greater power and acceleration. That means faster climbing, higher average speeds, and more available train paths for both freight and passenger services.

Faster, longer, and more frequent services

Electric freight locomotives typically offer around twice the power of diesel. They can move longer trains, increase payloads, and have the potential to cut journey times by two to three hours on routes between England and Scotland helping operators make better use of locomotives and wagons and supporting freight growth. Research is now underway to consider how freight trains could be accelerated, and what the benefits are of doing so.



Electrification infrastructure needed for passenger trains

The Chartered Institute of Logistics and Transport has identified the electrification needed to allow 95% of freight trains to run electricallyⁱⁱⁱ. Aside from a small number of infill schemes and terminal connections, most of this infrastructure is also needed for passenger services. Therefore, including freight benefits in the case for passenger electrification would strengthen the business case further.

The RIA Electrification Cost Challenge 2.0^{iv} report also shows that costs could fall by around a third compared to a best practice project today if electrification is delivered through a rolling programme rather than the current stop-start, project-by-project approach.

Also, a clear integrated strategy from Great British Railways would give freight operators greater confidence to invest in electric and hybrid locomotives as diesel fleets approach replacement.

Recommendation 1

To increase the use of electric and bi-mode locomotives, GBR should:

- Consider how it can provide discounts for or incentivise the use of electric haulage or otherwise support the costs of new locomotives
- Ensure the pricing of electric haulage is competitive relative to diesel

Recommendation 2

To maximise the value of existing electrification, GBR should:

- Infill identified short sections to create more end-to-end electrified routes
- Review and improve existing power supplies to enable freight to operate wherever wires are available

Medium-term opportunities to maximise rail freight, support growth, and benefit passengers

As the Rolling Stock and Infrastructure Strategy develops, freight needs should be considered alongside passenger needs. If passenger electrification expands to cut costs, improve performance, and support decarbonisation, it should also be designed to unlock freight benefits.

Recommendation 3

To ensure new electrification schemes are designed to support freight, GBR should:

- Ensure that the specification for new passenger electrification schemes (including power supply) supports freight use on any route that freight currently operates on or is likely to
- Consider the location of gaps in discontinuous electrification and discrete charging provision to support freight operations, including consideration of gradients and long-term battery hybrid potential
- Work collaboratively to identify incremental additions to passenger electrification schemes which would fill in freight electrification gaps

Options for replacing diesel freight locomotives



Electric locomotives are the optimum long-term solution

If more of the network is electrified, electric-only locomotives are the best long-term option for freight. They deliver the capacity benefits described earlier and offer four clear advantages:

- More reliable - Electric freight trains are more reliable than those hauled by diesel locomotives. Electric trains require less maintenance and spend less time in depots.
- More energy efficient - Electric trains draw energy directly from the grid to power their motors and so have no onboard energy storage or conversion process. As a result, they are almost three times more energy-efficient than diesel. Moreover, electric trains can recover energy from braking (regenerative braking) and feed it back into the grid or directly to nearby trains, recovering between 8% and 30% of the train's energy consumption. Unlike all other rail traction, the power of electric trains is limited only by what can be drawn from the wires. This extra power offers improved services at a lower energy cost.
- More affordable - Over a 30-year vehicle life, the total purchase, maintenance, and traction energy costs of electric freight locomotives are significantly less per vehicle than diesel or hybrid equivalents. Electric freight trains also reduce track maintenance work costs, while electric rail infrastructure is cheaper over its working life.
- Zero carbon - electric trains are zero-carbon 'at the wheel'. They are quieter and have no harmful emissions.



Bi-mode locomotives are a practical interim solution

Bi-mode (electric and diesel) locomotives, such as the Class 93 (which also has a small battery) and the Class 99, are an important transition technology. They can use overhead wires where available and switch to diesel where they are not, allowing operators to capture many of the benefits of electric traction today.

Battery-only locomotives are not a substitute for main line electrification

Research from the University of Birmingham concludes that battery-only locomotives have a role in shunting and very short trips, but they are not a substitute for main line electrification.

Hybrid locomotives are likely to become more important over time

The same research suggests that hybrid (electric and battery) locomotives combining electric power and batteries are not a direct replacement for the 'go-anywhere' diesel, but they could be viable on multimodal routes with only short unelectrified sections. Their role is likely to grow as battery technology improves and more of the network is electrified.

In time, hybrid locomotives may be particularly useful for low-speed last-mile operation and on routes with discontinuous electrification, carefully planned to address the freight challenges of unwired distance, gradients and recharging.

Continued reliance on internal combustion forfeits major economic benefits

Low-carbon fuels such as HVO can reduce emissions from diesel locomotives and may be a practical short-term choice for customers willing to pay a premium.

But over the long term, internal combustion cannot deliver the performance and capacity benefits of electric traction. That means continuing reliance on diesel-based power will limit benefits for both freight and passengers. Continued reliance on fossil fuels is also an energy security and cost risk as recent events have demonstrated.

As diesel fleets reach the end of their working lives, the industry should move towards a combination of electric and hybrid traction, supported by coordinated planning across the sector.

Bi-mode locomotives can play an important bridging role during that transition.

Pragmatically, it would be acceptable for bi-mode locomotives to be used for their economic lives, especially if fuelled with low-carbon alternative fuels.

Conclusion

To unlock the full economic and environmental value of rail freight, the immediate priority is to maximise electric haulage wherever existing infrastructure already allows it.

The key enabler is a clear, trusted rolling stock and infrastructure strategy that gives operators confidence to invest and plan for the phase-out of diesel-only fleets.

Priority actions include:

- Freight operators and Great British Railways to collaborate to increase the use of electric freight traction on existing electrified routes, improving both capacity and performance.
- Undertake a cross-industry review of current and planned power supply and charging infrastructure, supported by tactical interventions where known weaknesses constrain freight use.
- Consider incentives for investment in electric and hybrid locomotives, including track access charge discounts and competitive electricity pricing.
- All industry parties to work together to accelerate the 'Faster Freight' initiative with the objective of increasing capacity on existing electrified corridors.
- Develop a cross-industry business case for freight electrification, including targeted infill schemes where passenger electrification is not yet required.
- Prioritise the electrification of short and medium-distance gaps on key corridors to unlock earlier use of electric freight capability.
- In the short term, support investment in multi-mode (electric and diesel) locomotives that can use overhead wires where available and operate beyond them where necessary.
- In the medium term, support the introduction of new electric and, where appropriate, hybrid (electric and battery) locomotives as passenger electrification expands and diesel fleets approach life expiry.
- Ensure that these investments are underpinned by affordable access and electricity charges.
- Introduce battery locomotives in terminals where they can deliver practical operational benefits.





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