The ECML Case for High Performance Rail

How Incremental Investment on the East Coast Main Line Beat the Big-Bang HS2 Model; implications for HPR vs ALTO evaluation

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Independent, non-partisan citizen research

Executive Summary

This brief uses the East Coast Main Line (ECML) as a case study in the incremental improvement model of rail investment. The ECML is a 393-mile electrified rail corridor linking London King's Cross with Edinburgh Waverley. Over a 25-year period from 2000 to 2025, the ECML has grown from approximately 13.5 million annual franchise passenger journeys to an estimated 26 million, a near-doubling achieved without any new-build infrastructure. On the London–Edinburgh corridor specifically, rail has shifted from a minority mode (approximately 32% of combined rail+air travellers in 2010) to the majority mode (approximately 56–57% by 2022–24), overtaking air travel for the first time in modern British transport history.

This trajectory is contrasted with HS2, the purpose-built high-speed greenfield programme announced in 2009 to serve the same national corridor. HS2 has spent an estimated £37.9 billion to April 2025 and has laid no track. It will not reach the cities that anchored its original business case: Edinburgh, Manchester and Leeds. The cost-per-mile of the residual London–Birmingham segment now exceeds the entire ECML investment programme by a factor of ten or more in real terms.

The comparison is directly relevant to the evaluation of the proposed ALTO HSR southern Eastern Ontario corridor. It establishes that incremental improvement of existing corridors, with a co-located new build at conventional speed, can deliver substantial ridership growth and modal shift at a fraction of the capital and risk exposure of greenfield high-speed construction. The Coalition for Better Rail proposes High Performance Rail (HPR) as the Canadian application of this principle: High Performance Passenger Rail (HPPR) at 200 km/h co-built with the planned 401 widening, paired with High Performance Freight Rail (HPFR) on a liberated CN Kingston Subdivision.

Key Findings

- **ECML franchise journeys grew from 17.2 m (2010/11) to ~26 m (2024/25)**. This is a 51% increase in 15 years under incremental investment, with no new-build line.
- **Rail's share of London–Edinburgh combined rail+air travel rose from ~32% (2010) to ~57% (2022)**, crossing 50% for the first time in April 2022, on a corridor where trains take 4h 15–20 min, not 2 hours.
- **Modal shift accelerated sharply when low-fare open-access operator Lumo launched in October 2021** demonstrating that price competition is as powerful a driver of modal shift as journey time reduction.
- **Total ECML capital investment from electrification to Azuma fleet is estimated at £4–7 bn in 2025 real terms.** HS2 Phase 1 alone, serving a shorter corridor and not yet open, is projected to cost £67–100 bn+.
- **HS2 has been truncated from a 4-city high-speed network to a single 140-mile London–Birmingham segment** — losing the national connectivity that constituted its core benefit.
- **Three of four ECML private franchise operators failed financially or were terminated early**; both periods of public operation outperformed private predecessors which is a directly relevant precedent for P3-structured HSR financing.
- **The ECML evidence base validates HPR's design choices**: 200 km/h is sufficient for majority modal share at corridor lengths under 600 km; price competition matters more than raw speed; and incremental, co-located construction delivers benefits from year one rather than at network completion.

Section 1: The ECML Improvement Model (2010–2025)

1.1 Background and corridor definition

The East Coast Main Line runs 393 miles from London King's Cross to Edinburgh Waverley via Peterborough, Grantham, Newark, Retford, Doncaster, York, Darlington, Durham and Newcastle. It was built by three Victorian railway companies between 1845 and 1868, electrified at 25 kV between 1988 and 1991, and privatised in 1996. The line is owned and maintained by Network Rail; passenger services are operated by LNER (long-distance, since 2018), with open-access competition from Hull Trains (since 2000), Grand Central (since 2007) and Lumo (since 2021).

A third of the UK population lives within 20 minutes of an ECML station. The line carries both intercity passenger services and heavy freight, demonstrating that mixed-use operation on an existing corridor is sustainable at high passenger volumes. This is a structural point relevant to debates about the CN Kingston Subdivision and the HPR proposition that passenger and freight optimisation on a single corridor are physically incompatible.

1.2 Key investments since 2000

The ECML performance record since 2000 reflects a series of discrete, independently productive investments rather than a single megaproject:

- **2003–05:** InterCity 225 refurbishment programme. Bombardier Transportation overhauled the Class 91 locomotive fleet and Mk.4 coaching stock under Project Mallard. Cost approximately £230 m. Extended the existing 1991 fleet by 15+ years.
- **2000–07:** Open-access competition introduced. Hull Trains (2000) and Grand Central (2007) launched competing services on ECML paths, driving price competition and stimulating demand growth. Both operate to date.
- **2019:** Azuma Class 800/801 fleet enters service. 56 bi-mode trains built by Hitachi under the Intercity Express Programme at approximately £2.7 bn. Replaced all IC125 and most IC225 sets. Delivered reliability improvements and modest journey time gains.
- **October 2021:** Lumo open-access operator launches. Low-fare London–Edinburgh focused service; cheapest fares from £26.90. Carried its millionth passenger within 13 months. Directly targeted the air travel market. Modal shift accelerated immediately.

Section 2: ECML Passenger Data and Rail/Air Modal Split (2010/11–2024/25)

2.1 Annual franchise passenger journeys and modal split

The following table covers the LNER/predecessor franchise (long-distance intercity services only, excluding Great Northern commuter services and open-access operators). Modal split figures are estimates for the London–Edinburgh corridor pair specifically, derived from ORR rail flow data and CAA domestic aviation route statistics. Highlighted rows: amber = COVID disruption; green = modal shift year.

Year	Pax (m)	Operator	Rail %	Air %	Key context
2010/11	**17.2**	East Coast (state)	~32%	~68%	State operator rebuilds confidence after NXEC collapse
2011/12	**18.0**	East Coast (state)	~33%	~67%	Record revenues; £440 m returned to Treasury
2012/13	**18.6**	East Coast (state)	~33%	~67%	Continued public outperformance; Grand Central adds Edinburgh
2013/14	**19.8**	East Coast (state)	~34%	~66%	Best year under state management; £1 bn+ to Treasury over period
2014/15	**20.1**	East Coast / VTEC	~34%	~66%	VTEC takes over March 2015
2015/16	**20.5**	VTEC	~34%	~66%	VTEC timetable; new pricing initiatives
2016/17	**21.0**	VTEC	~35%	~65%	Growth continues; VTEC losses mount behind the scenes
2017/18	**21.8**	VTEC	~35%	~65%	Final VTEC year; franchise terminated 3 years early
2018/19	**23.0**	LNER (state)	~36%	~64%	LNER takes over June 2018; Azuma enters service May 2019
2019/20	**22.1**	LNER	~36%	~64%	Pandemic truncates year from March 2020

Year	Pax (m)	Operator	Rail %	Air %	Key context
2020/21	**4.8**	LNER	~55%	~45%	COVID lockdowns collapse both rail and air
2021/22	**15.8**	LNER	~52%	~48%	Lumo open-access low-fare service launches October 2021
2022/23	**24.1**	LNER	~57%	~43%	First time rail > air on London–Edinburgh; 57% rail share
2023/24	**25.0**	LNER	~56%	~44%	LNER at 111% of 2019 levels
2024/25	**~26.0**	LNER	~56%	~44%	Estimated; Edinburgh Airport record 15.8 m total pax

Sources: ORR Passenger Rail Usage Statistics; DfT Aviation Statistics Table AVI0501; CAA UK Airport Data domestic route tables; Lumo press releases Oct 2022; Transform Scotland modal split research Nov 2022; LNER press release Jun 2023; Edinburgh Airport annual passenger data. Pre-2022 modal split figures are estimates; 2022–24 figures reflect published research. The 2024/25 figure is an annualised estimate from ORR Q1–Q2 2025 data and Edinburgh Airport's 15.8 m full-year total for 2024.

2.2 ECML London–Edinburgh journey times (selected years)

The following table records best-available and typical timetabled journey times over the same period. The absence of significant journey time improvement since 1991 underscores that ECML modal shift gains have been driven primarily by frequency, price and passenger experience — not speed.

Year	Fastest service	Typical timetable	Context
1991	**4 h 00 m**	4 h 20 m	IC225 full electrification; 140 mph capability; regulatory cap kept to 125 mph
2003	**4 h 00 m**	4 h 26 m	Post-Hatfield recovery; refurbished IC225 fleet
2011	**4 h 00 m**	4 h 20 m	East Coast state operator; IC225 at peak
2019	**4 h 02 m**	4 h 20 m	Azuma Class 800 enters service; journey times marginally improved
2022	**4 h 16 m**	4 h 20–25 m	Azuma fleet fully deployed; Lumo non-stop 4 h 36 m low-fare option
2024	**4 h 16 m**	4 h 20 m	No new infrastructure; same times as 1991 IC225 peak
HS2 (projected)	**~3 h 30–40 m***	n/a	Edinburgh time projected with HS2 to Leeds — it will not reach Leeds

Note: The 125 mph (200 km/h) maximum speed cap on the ECML has remained in force since 1991. The infrastructure is capable of 140 mph and Class 91/IC225 sets were rated for 140 mph; regulatory constraints have prevented operational use above 125 mph. Azuma Class 800 trains are also limited to 125 mph on this route. This means modal shift to approximately 57% rail share has been achieved without exploiting the corridor's full speed potential — and entirely at HPPR's design speed of 200 km/h.

Section 3: The HS2 Big-Bang Model — Origins, Promises, and Outcomes

3.1 The original vision

High Speed 2 was first formally proposed by the Labour government in 2009 as a response to capacity constraints on the West Coast Main Line and the East Coast Main Line. The original business case was built on national connectivity: London to Birmingham in 45 minutes, Birmingham to Manchester in 41 minutes, and a northern extension that would eventually bring Edinburgh within approximately 2 hours of London. The initial cost estimate was £20 billion for the full network, with Phase 1 (London–Birmingham) opening in 2026.

The project's justification rested explicitly on the cities and passenger volumes it would serve north of Birmingham. The Birmingham–London segment in isolation, a 140-mile corridor already served by the West Coast Main Line at 2 h 00–2 h 20 m, had a much weaker cost-benefit case. The national network connectivity was not incidental to the business case; it was the business case.

3.2 The progressive truncation of scope

Year	Event	Status
2009–10	Labour government proposes HS2: London to Edinburgh via Birmingham, Manchester & Leeds. Cost estimate: £20 bn. Opening date: 2026.	**Announcement**
2012	Coalition authorises Phase 1 (London–Birmingham). Phase 2 (Birmingham–Manchester/Leeds) planned. Cost revised to £32 bn.	**Authorised**
2017	HS2 Phase 1 Act receives Royal Assent. Construction to start 2019. Opening still promised for 2026. Cost now ~£40 bn.	**Royal Assent**
Sep 2020	Construction formally begins on 350+ sites across 140-mile London–Birmingham corridor.	**Construction**
Oct 2021	Phase 2 eastern leg (Birmingham–Leeds) quietly reduced in scope.	**Scope cut**
Nov 2021	Phase 2 eastern branch formally cancelled by Boris Johnson. Leeds dropped entirely.	**Cancelled**
Oct 2023	PM Sunak cancels all of HS2 north of Birmingham. Manchester gone. Edinburgh never. £37.9 bn spent so far.	**Major cancel**
Oct 2024	Labour confirms it will not resurrect cancelled phases. 'Litany of failure' independent review ordered.	**Confirmed**
2025	Programme reset under new CEO Mark Wild. No track laid. 70% of earthworks done. No opening date set.	**Reset**
~2030	Projected opening: Old Oak Common to Birmingham Curzon Street only. Euston connection follows 2031–2035.	**Projected open**

Sources: Wikipedia HS2 article (March 2025 revision); House of Commons Library Research Briefing CBP-9313 (March 2026); HS2 6-monthly Report to Parliament, July 2025 (DfT/Heidi Alexander); HS2 Ltd Project Update (hs2.org.uk, October 2025); Construction Review Online, June 2025.

3.3 Current status (April 2026)

As of April 2026, HS2 is in a programme reset under CEO Mark Wild. No track has been laid on the 140-mile Phase 1 route. Approximately 70% of earthworks between London and Birmingham are complete, and all twin-bore tunnelling on the Old Oak Common to Birmingham Curzon Street opening section is finished. The reset is prioritising a 50-mile test section between Birmingham and the Chilterns to enable systems testing while civil engineering continues elsewhere. This is a methodology borrowed from the Crossrail recovery.

A new cost and schedule baseline is expected from HS2 Ltd in 2026. The Transport Secretary confirmed in June 2025 that trains will not be running by 2033 as previously planned; no new opening date has been set. The section from Old Oak Common to Birmingham Curzon Street is currently projected to open around 2030, with the Euston connection following between 2031 and 2035. Beyond Birmingham, HS2 will not be built.

Section 4: Direct Comparison — Cost, Scope and Outcomes

4.1 Investment comparison

Investment	Nominal cost	2025 real terms	Scope	Status
ECML electrification (1988–91)	~£450 m	~£1.5 bn (2025)	London King's Cross to Edinburgh Waverley; 393 miles	Delivered; immediate revenue
InterCity 225 refurbishment (2003–05)	~£230 m	~£500 m (2025)	IC225 fleet overhaul; 10+ years additional service	Delivered; operational
Azuma Class 800/801 fleet (2016–21)	~£2.7 bn	~£3.2 bn (2025)	56 bi-mode trains; faster acceleration; better reliability	Delivered; in daily service
ECML incremental total (1988–2025)	**~£4–5 bn**	**~£6–7 bn (2025)**	**All major investments inc. electrification, rolling stock, signalling**	**In full service**
HS2 Phase 1 (London–Birmingham only)	**£37.9 bn spent to Apr 2025**	**£67–100 bn+ final estimate**	**140 miles; no track laid Mar 2025; Edinburgh: never**	**Not open; no date confirmed**

HS2 Phase 1 cost sources: £37.9 bn spent to April 2025 (Construction Review Online, April 2025, citing official DfT figures); £25.3 bn additional committed 2026–30 (HS2 6-monthly Report to Parliament, July 2025); total projected final cost £67–83 bn in nominal prices (DfT/HS2 Ltd), with some independent forecasts placing total above £100 bn. ECML investment figures are estimates from published project costs in nominal prices, converted to approximate 2025 real-terms equivalents.

4.2 What each approach delivers — a side-by-side assessment

Dimension	ECML (incremental)	HS2 Phase 1 (big-bang)
Capital investment	~£4–7 bn (2025 real terms), full 393-mile corridor	£67–100 bn+ projected, 140-mile London–Birmingham only
Opening / revenue	Operational since 1852; every upgrade revenue-generating from day one	Not yet open; no confirmed opening date as of April 2026
Cities served	London, Peterborough, York, Newcastle, Edinburgh + 20+ intermediate stops	London, Old Oak Common, Birmingham Interchange, Birmingham Curzon Street
Journey time (London–Edinburgh)	4 h 16 m (today); 4 h 00 m (1991 IC225 peak)	Will not reach Edinburgh
Modal shift (London–Edinburgh)	Rail overtook air in 2022; currently ~56–57% rail share	Not applicable — HS2 does not serve Edinburgh
Annual passengers (franchise)	~26 million (2024/25 est.); ~90% growth since 2000	Zero (not yet open)
Freight capacity	Shared corridor; 58 million tonnes in 2019	Passenger only; no freight provision
Private/public operation	Mixed history; public (LNER) outperformed private in both eras	To be determined; Euston station seeking private funding
Scope delivered vs. promised	Substantially as designed; incremental additions ongoing	~35% of original network scope (by city-pairs) delivered

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Section 5: Lessons for ALTO Evaluation

5.1 Modal shift does not require 2-hour journey times

The most significant finding of the ECML case study is that rail achieved majority modal share on a 632-km corridor, eclipsing air travel, with average journey times of approximately 4 h 20 minutes, using infrastructure and rolling stock that were incrementally upgraded over decades. The commonly stated threshold for rail dominance over air is 2.5 to 3 hours door-to-door. The ECML case demonstrates this threshold is neither fixed nor necessary: what matters is the combination of journey time, frequency, city-centre to city-centre convenience, reliability, price and passenger experience.

For ALTO evaluation, this finding challenges the implicit assumption that only a new high-speed corridor operating at 300+ km/h can achieve the modal shift benefits attributed to the project. The ECML evidence suggests that targeted investment at conventional high-performance speeds — electrification, improved rolling stock, open-access competition, dedicated passenger track — may achieve comparable modal outcomes at substantially lower capital cost. The HPR proposal at 200 km/h, with HPPR Toronto–Ottawa at ~2 h 55 m and Toronto–Montréal at ~3 h 38 m, sits comfortably below the threshold the ECML achieved at 4 h 16 m.

5.2 Price competition is a more powerful modal shift lever than speed alone

The sharpest acceleration in ECML modal shift occurred not with the introduction of the Azuma fleet in 2019, but with the launch of Lumo's low-fare competing service in October 2021. The ECML's modal share jumped approximately 20 percentage points between pre-pandemic levels (~35%) and April–August 2022 (~57%). Lumo's launch, offering fares from £26.90 compared to LNER's typical advance fare of £40–80+, is widely credited as a significant driver of this shift.

Lumo effect: rail modal share on London–Edinburgh rose from ~35–36% (pre-pandemic) to 57% (Apr–Aug 2022) and 63% (July 2022 alone) following Lumo's October 2021 launch. The cheapest Lumo fare of £26.90 is consistently cheaper than the equivalent short-haul air fare including airport transfer costs.

This has direct implications for ALTO fare modelling. If fare-setting and open-access competition policy are not incorporated into the ALTO business case, ridership and modal shift projections may significantly overstate the impact of infrastructure investment alone.

5.3 The risk of scope reduction under cost pressure

HS2's progressive truncation from a 4-city national network to a single 140-mile segment provides a sobering precedent for large-scale greenfield HSR. The cities removed from scope (Manchester, Leeds, Sheffield, Edinburgh) represented the majority of the original project's passenger demand and economic benefit. Once construction began and sunk costs accumulated, the political economy of the project made it difficult to cancel outright but economically unjustifiable to complete as originally designed.

This dynamic has also been observed in the Eglinton Crosstown and Ottawa O-Train projects in Canada. It suggests that large infrastructure commitments carry an asymmetric risk: the costs are locked in early, while the benefits (the network) are delivered last and are therefore most vulnerable to cuts. ALTO's proposed southern Eastern Ontario corridor carries analogous scope risks if cost overruns or political changes materialise after initial construction commitments are made.

5.4 Franchise instability as a P3 risk proxy

The ECML has cycled through five operators since privatisation, with three of four private operators failing financially (GNER, NXEC, VTEC) and a fourth (East Coast) returning to public ownership before re-franchising to a fourth private operator (VTEC) which also failed. The two periods of public operation (East Coast 2009–15, LNER 2018–present) consistently outperformed private operators on both ridership and financial returns. East Coast alone returned approximately £1 billion to the Treasury during its 2009–2015 operation.

For ALTO, this history is relevant as a proxy for the viability of P3 or concession-based financing on a long-distance intercity corridor. The ECML is arguably the most commercially attractive intercity rail corridor in the UK. Yet it could not sustain profitable private operation for more than 7–10 years at a stretch. A less commercially mature corridor, operating in a less rail-mature market, faces materially greater franchise risk.

5.5 The counterfactual: what £37.9 billion could buy on existing corridors

The £37.9 billion spent on HS2 Phase 1 to April 2025 bought 140 miles of unfinished railway. This is approximately 5–10 times the estimated real-terms cost of all major ECML investments since electrification. Alternatively expressed: at the ECML cost-per-passenger-mile benchmark, £37.9 billion could theoretically fund incremental improvements to every major intercity corridor in England and Scotland simultaneously. While there are corridors and demand scenarios where new-build infrastructure is the only viable solution, the HS2 experience establishes that the opportunity cost of a single big-bang greenfield programme is very large.

Section 6: High Performance Rail — Applying the ECML Lesson to Canada

The ECML evidence base gains its full analytical force when applied to the Canadian context. The structural problems constraining VIA Rail are not merely analogous to the ECML story — they are, in important respects, its Canadian equivalent: a corridor where the root cause of passenger rail dysfunction is not the absence of high-speed infrastructure but the compelled sharing of freight-controlled track. High Performance Rail (HPR) — the Coalition for Better Rail's proposed alternative to ALTO — addresses that root cause directly through two paired components: a new dedicated passenger railway along the Highway 401 corridor at 200 km/h (HPPR), and a liberated CN Kingston Subdivision dedicated to optimised intermodal freight (HPFR). The ECML case study provides the strongest available evidence base for why this approach is credible.

6.1 The structural parallel: CN track sharing and the ECML franchise problem

The ECML's history since privatisation is a record of dysfunction driven by the misalignment between infrastructure ownership, train operations, and passenger service obligations. Three of four private franchise operators failed financially; both periods of public operation outperformed them. The cause in each case was structural: operators were committed to revenue forecasts on infrastructure they did not control, subject to capacity constraints they could not resolve, and priced into franchise premiums that assumed growth the shared-track regime could not deliver.

VIA Rail faces an identical, acute, structural problem. VIA owns only 3% of the track it operates. The CN Kingston Subdivision, the 540-km spine of the Toronto–Montréal corridor, is entirely CN property, operated on CN's terms. CN's statutory freight priority under section 116 of the Canada Transportation Act means that VIA's new Siemens Venture fleet, capable of 200 km/h, operates at an average speed of approximately 74–78 km/h on a corridor that is physically capable of far more. VIA's on-time performance has collapsed from 82% in 2013 to 51% in 2024, with 80% of trains running late in February 2025. VIA's operating loss in 2024 was CAD $385.2 million, more than double its revenue.

The ECML parallel: Just as HS2 was proposed to resolve ECML capacity by building a new parallel corridor around the problem, ALTO HSR proposes to resolve CN track sharing by building around it at greenfield 300+ km/h. The ECML case study demonstrates that the alternative, resolving the root cause through investment that frees the existing corridor, delivered equivalent or superior passenger outcomes at a fraction of the cost. HPR adapts that principle to Canadian conditions: rather than upgrading the Kingston Sub for mixed use (the

strict ECML model), it separates passenger and freight onto purpose-fit corridors so each can be optimised independently.

6.2 HPR: core concept

HPR has two integrated components. High Performance Passenger Rail (HPPR) is a new, dedicated, electrified double-track passenger railway co-built within the planned Highway 401 widening corridor between Toronto and the Quebec border, designed for 200 km/h operation with VIA Rail's already-procured Siemens Venture fleet. HPPR uses VIA-owned Smiths Falls Subdivision from a Brockville crossover to reach Ottawa (Toronto–Ottawa ~2 h 50 m), and the VIA-owned Windsor–London corridor plus a liberated CN Dundas Subdivision to reach Toronto–Windsor (~2 h 30 m). No new construction is required in the GTA: HPPR connects through Union Station via the existing Lakeshore corridor.

High Performance Freight Rail (HPFR) is what the CN Kingston Subdivision becomes once passenger services move to HPPR. Without the requirement to interleave VIA passenger trains, CN can run longer trains on optimised timetables, eliminate dwell time at sidings, electrify the corridor over time, and re-establish competitive intermodal service on the Montréal–Toronto axism a market it has lost to trucking. The freight efficiency dividend at maturity is estimated at approximately C$440 million per year, with 570,000–690,000 fewer truck movements per year on the 401, and a potential C$3–6 billion saving by widening the 401 to 6 lanes rather than 8.

The slogan is straightforward: Build One; Make One Free. One new passenger railway. Two transformed networks.

6.3 ECML evidence applied: the four-hour threshold and the price effect

The single most policy-relevant ECML finding for ALTO evaluation is that rail achieved majority modal share at journey times of approximately 4 h 15–20 minutes — not 2 hours, not 3 hours. HPR's modelled Toronto–Montréal journey time of ~3 h 38 m, Toronto–Ottawa of ~2 h 55 m, and Toronto–Windsor of ~2 h 30 m all sit firmly below the ECML threshold. The ECML evidence directly challenges the implicit assumption that only sub-3-hour greenfield HSR can deliver competitive modal shift.

The ECML also demonstrates that the sharpest modal shift acceleration coincided not with new infrastructure but with the launch of Lumo's low-fare competing service in October 2021. Rail's London–Edinburgh modal share jumped approximately 20 percentage points within 12 months. HPPR's structural separation from CN freight creates exactly the operating conditions for equivalent open-access competition in Canada: multiple operators, competing fares, and service frequencies that no shared-track regime with CN can sustain.

The Lumo precedent for Canada: Lumo's £26.90 London–Edinburgh fare is broadly comparable to a CAD $45 Toronto–Montréal fare. This drove rail modal share for this trip segment to 63% in July 2022. A dedicated, electrified HPPR corridor with open-access competition at equivalent price points would target YYZ–YUL's ~2.9 million annual passengers more effectively than infrastructure investment that leaves the structural fare premium of monopoly rail service unchanged.

6.4 The 50-year carbon case: a structural advantage for HPR

HPR's companion lifecycle analysis establishes that the two programmes occupy fundamentally different positions in climate accounting. HPR's construction carbon of approximately 3.77 Mt CO_2e is roughly 3.9 times less than ALTO's 14.69 Mt central estimate, primarily because HPR

uses the already-disturbed 401 right-of-way for HPPR and existing infrastructure for HPFR. At a central operating estimate of 6 million HPPR passengers per year and 3,000 displaced truck movements per day on HPFR, HPR delivers a net annual saving of approximately 365,000 tonnes CO_2e per year and pays back its construction carbon in approximately 11 years.

ALTO HSR's 50-year lifecycle position, under the most likely opening conditions (current Ontario grid (73.8 g/kWh), moderate ridership of 8 million passengers annually, and a vehicle fleet that will be substantially electrified before ALTO's trains run) is a net emitter of approximately 22 Mt CO_2e over the same period. Carbon payback under these conditions is approximately 101 years. At 4 million annual passengers, consistent with ALTO's early operating years, payback exceeds 500 years on the current grid with a partially electrified fleet. On a gas-expansion grid scenario, ALTO never pays back at all.

The structural reason mirrors the ECML lesson precisely: HPFR displaces diesel Class 8 freight trucks, a mode that will not electrify at the pace of the passenger car fleet. By the time ALTO opens (optimistically 2040–2045), a material share of the journeys it hopes to capture will already be made in EVs whose per-km emissions are at or below ALTO's at moderate ridership. The freight CO_2 saving does not narrow as passenger cars electrify.

6.5 Co-benefits HPR delivers that ALTO structurally cannot

- **Highway 401 road safety:** removing 2,250+ heavy commercial vehicles per day (central scenario) prevents an estimated 5–9 fatal collisions per year and avoids $45–110 M in annual accident costs. ALTO does not reduce a single freight truck trip on the 401 under any alignment.
- **Pavement and bridge preservation:** a 25% HCV reduction extends the 401's resurfacing cycle by 4–7 years and avoids an estimated $2.8–6.5 B in Ontario and Québec highway expenditure over 30 years. This benefit is structurally unavailable to a passenger-only programme.
- **CN network capacity release:** with HPFR running an optimised dedicated corridor, path capacity opens up across the wider CN network for Northern Ontario mining output (Sudbury nickel, Ring of Fire chromite — projected at 10–24 Mt/year by 2040), Prairie grain through Thunder Bay, and Ontario Northland passenger reliability. ALTO touches none of these flows.
- **Port of Montréal / Contrecoeur synergy:** Contrecoeur's 1.15-million-TEU expansion (commissioning 2030) uses a rail-at-dock design that eliminates drayage cost. HPFR is the missing inland link that allows that investment to reach its full national impact. ALTO offers no connection to Contrecoeur, no intermodal terminal, and no land-side port connection of any kind. The Contrecoeur opportunity is invisible to ALTO.
- **Supply chain resilience:** HPFR creates a dedicated domestic east–west freight corridor that reduces dependency on US border crossings at a moment when the 2025 25% tariff regime has made interprovincial logistics resilience a national priority. ALTO provides no freight function and no supply chain resilience benefit.
- **Distributed employment:** HPFR's intermodal hubs at Cornwall and Belleville, plus distributed maintenance employment along the corridor, place steady-state operational employment in communities with existing logistics infrastructure and post-manufacturing workforce capacity. ALTO's permanent employment concentrates at major urban terminal stations.

- **Co-construction savings:** HPPR built within the planned 401 widening saves an estimated $4–8 B in shared earthworks, drainage, mobilisation and grade separation costs available once and only once. This window closes when the next tranche of 401 widening contracts is awarded.

6.6 Synthesis: the ECML case study as a validation framework

The East Coast Main Line case study validates three specific claims HPR makes in the Canadian context. First: modal shift exceeding 50% can be achieved at journey times of 4 h 15–20 minutes, without new greenfield 300 km/h infrastructure, at a fraction of the capital cost of purpose-built HSR. HPR's projected journey times all sit comfortably below this threshold. Second: price competition is a faster and more powerful modal shift lever than journey time reduction. This finding challenges the central premise of ALTO's business case, which attributes modal shift primarily to speed. HPR's separation of passenger and freight onto purpose-fit corridors creates exactly the operating conditions an open-access competitive market requires. Third: incremental and co-located corridor upgrades generate revenue from day one, whereas big-bang greenfield programmes defer all benefits until network completion and are therefore most exposed to the scope-reduction dynamics that truncated HS2 from a 4-city network to a single 140-mile segment.

HPR operates in a different legislative and commercial context, and the corridor swap between HPPR and HPFR has no direct ECML precedent as the ECML stayed mixed-use throughout. But the ECML evidence base establishes, with 25 years of operational data, that the incremental improvement model is not a second-best alternative to greenfield HSR; it is a fundamentally different and often superior approach to the same policy objective. The federal government, before committing a further $60–90 billion to ALTO, should formally test whether HPR can deliver comparable passenger and environmental outcomes at materially lower cost and risk. The ECML case study establishes that the answer to that question is at least plausibly yes. It has not been formally asked.

Central recommendation: The Coalition for Better Rail recommends that the Parliamentary Budget Officer be commissioned to conduct a formal comparative lifecycle assessment of High Performance Rail against the ALTO HSR programme, using the ECML/HS2 case study as the international evidence base for the incremental improvement model.

Section 7: Data Sources and Methodology

Primary statistical sources

- Office of Rail and Road (ORR): Passenger rail usage statistics, quarterly and annual series 2000–2025 (dataportal.orr.gov.uk)
- Civil Aviation Authority (CAA): UK Airport Data, domestic route analysis, annual series 2000–2024 (caa.co.uk)
- Department for Transport (DfT): Aviation Statistics Table AVI0501; DfT Rail Statistics
- Transport Scotland: Scottish Transport Statistics 2023, Chapter 8 — Air Transport (transport.gov.scot)
- Edinburgh Airport: Annual passenger data and press releases 2000–2024 (corporate.edinburghairport.com)

HS2 sources

- Wikipedia: High Speed 2 (March 2025 revision); InterCity East Coast franchise history
- House of Commons Library Research Briefing CBP-9313: 'High Speed Rail 2 — An Overview' (updated March 2026)
- HS2 6-monthly Report to Parliament, July 2025 (Transport Secretary Heidi Alexander, gov.uk)
- HS2 Project Update, October 2025 (hs2.org.uk): construction milestones, reset details
- Construction Review Online, June/April 2025: cost figures, programme status
- GOV.UK: First HS2 Rail Tunnel Breakthrough Completed in Birmingham, May 2025

Operator and modal shift sources

- LNER press release, June 2023: 'A Record Two Years for LNER' — confirms 2022/23 = 2018/19 + 1 m journeys
- Lumo press release / ianvisits.co.uk, October 2022: 63% rail share in July 2022; 57% Apr–Aug 2022
- Transform Scotland, November 2022: 'Rail Overtakes Plane as Most Popular Method of Transport Between Edinburgh–London'
- Railway Technology / GlobalData, September 2023: 'The Great Modal Shift' — rail share increased from 35% to 63% with open-access competition
- Which?, December 2023: Domestic flights vs trains — comparative fare, time and emissions analysis
- Virgin Trains East Coast: 21.8 million journeys in 2017/18 (mediarail.be/LNER article)

HPR / Canadian sources

- Coalition for Better Rail, HPR Strategy: Build One; Make One Free, April 2026 (beyondalto.ca)
- Citizen Research Initiative, HPR 50-Year Lifecycle CO2 Budget Analysis, April 2026
- VIA Rail Canada Annual Reports 2013–2024; VIA on-time performance data, February 2025

- Transport Canada, Canada Transportation Act, s.116 (statutory freight priority)
- Port of Montréal, Contrecoeur Container Terminal project documentation

Methodology notes

Franchise passenger data covers the InterCity East Coast long-distance franchise only. Open-access operators (Hull Trains, Grand Central, Lumo) add approximately 5–8% to total ECML passenger volumes and are excluded from the franchise series for consistency. Modal split figures for London–Edinburgh represent the corridor pair specifically (not the full ECML catchment) and are estimates where direct data is unavailable. COVID years (2020/21 and 2021/22) are shown for completeness but should not be treated as trend data points. All monetary figures are noted as nominal or approximate 2025 real-terms as stated. HS2 cost figures are the most recently published official estimates; some independent forecasts are materially higher. HPR figures are drawn from Coalition for Better Rail published research; readers are referred to beyondalto.ca for the full evidence base.
